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# SECTOR STUDY: Incremental National Pollution Control Costs and Benefits Summary

DRAFT REPORT

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## I. Introduction

The Sector Study examines the economic impacts of 88 EPA regulations and regulatory options on three sectors of the U.S. economy-small businesses, agriculture and municipalities. As part of this study, we also have summarized the incremental national costs and benefits that previously have been estimated for many of these EPA regulatory actions and proposals. The regulatory cost data have been placed in comparable units of measurement and, along with the reported quantified benefit data, are summarized in Table 1. This section is devoted to the explanation of the cost estimates, including the data sources and the methodology used for standardization, and their correct interpretation. More detailed documentation on the calculations of the individual cost estimates as well as brief background information on each of the examined regulations are provided in Appendix A.

## II. Incremental Social Cost Estimates

### A. Definition and Measurement

The incremental national (or social) costs of any particular environmental regulation are the net economic costs it imposes on producers and consumers beyond those control costs associated with before-regulation industry practices, plus the governmental costs of implementing and enforcing the regulatory requirement. These incremental economic costs represent the value that society places on the goods and services foregone as a result of additional resources being diverted to environmental protection. Ex ante estimates of social costs may be calculated by estimating the net loss in the economic surpluses incurred by producers and consumers in the input or output markets affected by the regulatory action. In order to generate such ex ante welfare measures, the private costs of meeting regulatory requirements must first be assessed. This may be

done using engineering cost models to identify and quantify the least-cost industry responses to regulatory requirements. 1/

Most regulatory cost analyses, however, do not use changes in economic surplus measures as a basis for ex ante estimation of the social costs of pollution control. Rather, regulatory analyses typically focus on estimating the amount of before-tax, added real resource costs borne by firms directly affected by the environmental regulation. This is usually accomplished by identifying and valuing the additional inputs-both fixed and variable-that firms would need to employ in order to meet regulatory requirements. Consideration is given to the timing of additional input needs so that present values for costs can be computed. Cost estimates typically are calculated for a "model plant", and are used together with estimates of existing and planned facilities to calculate ex ante estimates of total present value compliance costs. In some regulatory analyses, sophisticated engineering cost models are used to identify regulatory costs. They rely on engineering data and process modeling to identify and value the industry's least-cost adjustments and responses to regulatory constraints. These models generally are superior to the simple accounting procedure because they provide for the identification of the indirect costs of regulatory requirements, as well as the direct compliance costs.

The national cost calculations reported in Table 1 are based primarily on ex ante estimates of the incremental before-tax, real resource costs to producers directly affected by regulatory requirements. In general, these cost estimates provide a reasonable approximation of social costs. For the most part these were estimated using the input cost accounting procedure, and to a lesser extent, engineering cost models.

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1/ It should be noted that ex ante estimates of regulatory costs, even when carefully constructed, often do not very accurately reflect actual or ex post costs. This is often the case because the assumed baseline pollution control practices do not accurately reflect those actually in place, or because the assumed level of compliance does not hold in reality.

However, economic surplus measures of social cost served as the basis for a few of the regulatory cost estimates presented in Table 1. A small portion of the cost estimates also include estimates of implementation and/or enforcement costs.

B. Data Sources

The cost estimates presented in Table 1 were derived from data taken from various information sources. The principal sources include Regulatory Impact Analyses (RIA) and Economic Impact Analyses (EIA) prepared for the evaluation of regulatory proposals. In cases where these or other comparable data sources (e.g. Pesticide Position Documents) were not available, we sometimes relied on other information sources, including: Federal Register notices of proposed and final rulemakings; internal EPA briefing documents; and raw data supplied by EPA program offices. In many cases where the information supplied by the above sources was ambiguous or incomplete, the source authors were consulted for additional information and data.

C. Annualized Cost Estimates

Table 1 provides annualized cost estimates for each regulatory action or proposal for which data was available. Below, we describe the general procedure used for calculating these estimates from the raw source data, plus the various adjustments and assumptions used when data deficiencies or uncertainties were encountered.

1. General Methodology

The basic methodology used to derive the annualized cost estimates included the following steps. First, the fixed costs (e.g., initial capital costs; governmental implementation costs) and annual variable costs (e.g., annual operating and maintenance, "O&M", costs; enforcement costs) associated with each regulation were identified from the relevant RIA or other information source and translated into 1986 dollars. Second, the fixed cost components were amortized over the reported expected life of the capital (or the reported life of the regulatory option) using two different rates of interest: 4 and

10 percent. [2] Third, the amortized fixed costs were added to constant annual O&M costs to calculate annualized costs for the regulatory option at each rate of interest. If only annual variable costs were associated with a particular regulation, then these costs served as the sole basis for the annualized cost calculations. [3]

For many of the regulations examined, the above procedure for standardizing cost estimates was not used. For example, in the few cases where the data sources reported social cost estimates based on economic surplus measures, the standardization procedure was not applicable. The more typical case involved a situation where the reported cost data could not be disaggregated into capital and O&M components. This was the case, for example, where the data sources simply did not report disaggregated regulatory costs, and we were unable to pull together this information. In these cases, cost estimates typically were reported by the data sources on a present value or annualized basis calculated using a specified rate of interest and time frame. If the reported costs were in present value terms, we annualized these costs using the same interest rate and time frame as was applied to derive the present value estimate. If an annualized cost estimate was reported, this is the estimate that was included in Table 1.

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[2] Unless the timing of fixed costs were explicitly stated in the data sources, it was assumed that they would be incurred in the first year of regulation. If fixed costs were reported to occur at specified staged intervals over time, the present value of these costs were first calculated and then amortized. If no expected operating life was specified for capital, a 20-year period was assumed, except for air regulations for which a 15-year period was used.

[3] If O&M costs were specified to vary from year to year, the present value of these costs were first calculated and then re-annualized over the expected operating life of capital.

2. Interpretation

As previously indicated, the ex ante social cost estimates reported in Table 1 are incremental costs that indicate the additional pollution control costs each of the regulations is expected to impose on society beyond those that are already being incurred. Moreover, these cost estimates are reported on an annualized basis. In order to fully understand what an annualized cost represents, one must first have an understanding of the amortization procedure used to annualize capital costs.

In the calculation of annualized costs, capital costs were amortized (i.e. annualized) before being added to annual O&M costs in order to account for the time value of money. The Capital Recovery Factor (CRF) is the number that, when multiplied by initial capital costs, provides annualized capital cost estimates. The CRF is determined by a formula which contains two variable parameters: the interest or amortization rate, **r,** and the number of years, **n,** over which amoritization is performed. Formally, the CRF indicates the number of dollars one can withdraw in each of **n** years if $1 is initially deposited at **r** percent of interest. As applied to amortize fixed costs, it measures the total dollar amount, divided into equal annual amounts over **n** years, that the initial fixed costs could have earned if they were invested at **r** rate of interest instead of spent on pollution control. In other words, annualized capital costs measure the annual real resource costs to producers of tying-up funds in the purchase and installation of capital equipment or other fixed assets required by EPA regulations. Annualized capital costs, when added to annual O&M costs, produces an estimate of the annual real resource costs associated with regulatory requirements.

The regulatory cost estimates have been annualized using two alternative interest rates: 4 percent and 10 percent. The 10 percent rate was used because this is the rate recommended by the Office of Management and Budget for analyzing regulatory costs; the 4 percent rate was used because it more closely reflects the social rate of time preference, the appropriate rate for discounting social costs. The difference in

magnitude between the cost of any regulation annualized at 4 percent and its cost annualized at 10 percent depends heavily on the magnitude of initial fixed costs in relation to annual variable costs. Since only fixed costs are amortized, the larger are fixed costs in relation to annual variable costs, the larger will be annualized cost at 10 percent in relation to annualized cost at 4 percent. Moreover, the time period over which fixed costs are amortized also helps determine the relative difference between annualized costs calculated using different interest rates. The greater the time period used for amortizing, the larger will be annualized costs at 10 percent in relation to annualized costs at 4 percent.

One final point on the annualized cost estimates is worth noting. The regulations examined include many that have been promulgated as well as regulations that have only been proposed or are currently under development. Thus, some of the regulations are currently imposing costs while others have yet to do so. Moreover, the actual effective dates for the implementation of these regulatory requirements may vary by as much as several years.

## III. Benefits Data

The benefit data reported in Table 1 represent the information on quantified benefits-either in physical units, monetary units, or both-that were reported in the data sources discussed in Section II.B. Whenever possible, we transformed the benefit data into annual terms. These transformations are given in parentheses under the reported benefit data in the table.

**Table 1. Incremental National Costs and Benefits Associated With Selected EPA Regulations and Guidelines That Have Been Promulgated, Proposed, or Are Currently Under Development (In Millions of 1986 Dollars)**

| Regulation/Guideline | Annualized Costs at Alternative Capital Recovery Rates, r (Time period, n, used in analysis) r = 4% | r = 10% | Other | Reported Quantified Benefits/Effects |
|---|---|---|---|---|
| **I. AIR** | | | | |
| 1. Stratospheric Ozone | NA* | NA | $726 (r=2%; n=87) | o Reported health benefits include:<br>- Non-melanoma skin cancers averted for people born before the year 2075: 150 million cases (2.96 million deaths).<br>- Melanoma skin cancers averted for people born before the year 2075:748,000 cases (179,000 deaths).<br>- Cases of cataracts averted: 17.55 million.<br>o Reported environmental benefits include: reduced risks to marine organisms; reduced risks to agriculture; reduced degradation of polymers; and reduced sea level rise. Reported present value for these benefits (r=3%; n=87): $94,820 million. (Annualized environmental benefits: $3,079 million.) |
| 2. Municipal Waste Combusters | $376 (n=20) | $518 (n=20) | | A preliminary assessment of the cancer risks associated with existing and planned facilities concluded that municipal waste combustion using the status-quo in add-on control technology will result in 4 - 60 cancer cases annually. If existing and planned facilities were required to install dry scrubbing control technology combined with very efficient particulate collection devices, annual cancer incidence would be reduced by 3.5 - 56 cases. |

* Not Available.

| Regulation/Guideline | Annualized Costs at Alternative Capital Recovery Rates, r (Time period, n, used in analysis) r = 4% | r = 10% | Other | Reported Quantified Benefits/Effects |
|---|---|---|---|---|
| 3. TSDF Air Standards | $12.8 (n=15) | $14.3 (n=15) | | Unspecified cancers reduced annually: .84 cases. |
| 4. Diesel Fuel Standards | $549 (n=15) | $660 (n=15) | | No Data. |
| 5. Light-Duty Truck and Heavy-Duty Engine $NO_x$ and Particulate Standards | $130 (n=11) | $136 (n=11) | | Annual individual cancer risk in the year 1995 reduced from $1.2 \times 10^{-} - 6.2 \times 10^{-6}$ to $.8 \times 10^{-6} - 4.1 \times 10^{-6}$ for the U.S. urban population. (Using census data for the U.S. urban population, we calculated cancers averted annually: 73 - 711 cases.) |
| 6. Gas Marketing | NA | $158 (n=33) | | Leukemia and kidney cancers averted annually: 48 cases. |
| 7. Lead Phasedown | $499 (n=8) | $510 (n=8) | | o Reduction in the number of children with blood lead levels above 15 ug/d1 over 8 years: 2.5 million (or 312,500 cases annually).<br>o Annual health benefits for adult males include: .22 million cases of hypertensiveness averted; 625 cases of myocardial infarctions averted; 125 strokes and 625 deaths averted.<br>o Reported undiscounted monetized values for the above health benefits plus maintenance and fuel economy benefits over each of 8 years. We calculated the present value at r=10% for these benefits and then re-annualized the value over 8 years. Total annualized benefits: $6,997. |
| 8. NAAQS: Lead | $80.8 (n=15) | $94.5 (n=15) | | No Data. |

| Regulation/Guideline | Annualized Costs at Alternative Capital Recovery Rates, r (Time period, n, used in analysis) r = 4% | r = 10% | Other | Reported Quantified Benefits/Effects |
|---|---|---|---|---|
| 9. NAAQS: Particulate Matter (Partial Attainment) | NA | $353 (n=7) | | o Annual health and welfare benefits include: 385 deaths averted; .4 million lost work days averted; 2.45 million reduced activity days averted; .14 million incidences of chronic respiratory disease averted; .55 million incidences of acute respiratory disease averted.<br>o Reported 1983 present value for the above benefits (r=10%; n=7) as $4,010-$11,821 million. We converted this to an annualized value (r=10%; n=7): $823 - $2,428 million. |
| 10. NESHAP: PCE (Dry Cleaners) | NA | NA | $24.09 (r=6%; n=15) | Unspecified cancers averted over 15 years: 83 cases (5.5 cases annually). |
| 11. NSPS Woodstove | Negative Costs Expected | | | Mortality, morbidity and residential soiling benefits valued at $306 million per year. (Physical benefits were not reported.) |
| 12. Fuel Volatility | Insufficient Data | | | |
| 13. Industrial Boilers | Insufficient Data | | | |
| 14. Rural Fugitive Dust | No Data | | | No Data. |
| 15. NSPS Small Boilers | No Data | | | No Data. |
| 16. NESHAP: Chromium | No Data | | | No Data. |
| **II. RADIATION** | | | | |
| 17. Radon | $1,040 (n=74) | $1,598 (n=74) | | Approximately 2500 lung cancer deaths averted annually. |
| 18. Radiofrequency Guidance | $7.74 (n=15) | $9.64 (n=15) | | No Data. |

| Regulation/Guideline | Annualized Costs at Alternative Capital Recovery Rates, r (Time period, n, used in analysis) r = 4% | r = 10% | Other | Reported Quantified Benefits/Effects |
|---|---|---|---|---|
| 19. Low Level Radioactive Waste | Negative Costs Expected | | | Benefits are highly uncertain. Health risks could range from 73 health effects (fatal cancers and first generation genetic effects) averted to 246 additional health effects over the next 10,000 years (or less than .1 health effect annually). |
| 20. High Level Radioactive Waste | NA | $3.51 (n=50) | | The benefits of this rule "consist of the general confidence these standards provide that management and disposal of these wastes will be accomplished with residual risks that are clearly very small." Since waste disposal currently is not done, there is no baseline cancer risk. Exposure to radioactive waste under the rule results in an increased risk of cancer (about half of these cancers result in death). Estimated cancer deaths are about .1 death annually. |
| **III. PESTICIDES** | | | | |
| 21. Large Volume Pesticides (EDB Only) | $48 (n= 1) | $48 (n=1) | | The reported dietary lifetime individual cancer risk estimates associated with EDB uses, when added together produce a lifetime individual risk (LIR) estimate of $3.55 \times 10^{-3}$. We multiplied this LIR by 240 million (reflecting the entire U.S. population), and divided this by 70 (reflecting average lifetime). Our upper bound estimate of cancers averted annually: 12,171 cases. |
| 22. Farmworkers | $171.2 (n=20) | $172 (n=20) | | No Data. |
| 23. Data Requirements | $207 (n= 1) | $207 (n= 1) | | No Data. |
| 24. Pesticides in Groundwater | No Data | | | No Data. |

| Regulation/Guideline | Annualized Costs at Alternative Capital Recovery Rates, r (Time period, n, used in analysis) r = 4% | r = 10% | Other | Reported Quantified Benefits/Effects |
|---|---|---|---|---|
| 25. Reregistration of Pesticides | No Data | | | No Data. |
| 26. Endangered Species | No Data | | | No Data. |
| **IV. TOXIC SUBSTANCES** | | | | |
| 27. Asbestos Ban and Phasedown | NA | $220 (n=20) | | Mesothelioma and lung cancers averted over 20 years: 218 cases (or 10.9 cases annually). |
| 28. Asbestos in Schools | $264 (n=30) | $340 (n=30) | | Expect significant reduction in lung cancers, gastrointestinal cancers, and mesothelioma cases. However, the RIA did not attempt a risk reduction analysis. |
| 29. Asbestos in Public Buildings | $4,219 (n=30) | $5,431 (n=30) | | Baseline risks of lung cancer, gastrointestinal cancer and mesothelioma are estimated to be 1,362 - 10,050 cases over 120 years (or using mid-point, about 47.55 cases per year). Control of these risks with regulation similar to the AHERA schools rule could eliminate most of these cases. |
| 30. PCBs: Electrical Equipment | NA | NA | $7.5 (r=3%; n=30) | No Data. |
| 31. Premanufacture Review Program | $32.4 (n=1) | $32.4 (n=1) | | No Data. |
| 32. PCBs: Transformers | Insufficient Data | | | |
| 33. Chlorinated Solvents | No Data | | | No Data. |
| 34. Inerts | No Data | | | No Data. |

| Regulation/Guideline | Annualized Costs at Alternative Capital Recovery Rates, r (Time period, n, used in analysis) r=4% | r=10% | Other | Reported Quantified Benefits/Effects |
|---|---|---|---|---|
| **V. SOLID AND HAZARDOUS WASTE** | | | | |
| 35. Subtitle D Criteria | $892 (n=20) | $978 (n=20) | | o Roughly 17 unspecified cancers averted over 300 years (or .0543 cases annually).<br>o Estimated present value savings of over $.98 billion in resource damages averted (annualized: $310 million; r=3%, n=300). |
| 36. Liner and Leachate Collection | NA | NA | $69.8 (r=3%; n=20) | No Data. |
| 37. Hazardous Waste Burning | NA | $8.4 (n=15) | | Unspecified cancers averted over 70 years: 3 cases (or .04 cases annually). |
| 38. Municipal Ash | $202 (n=1) | $202 (n=1) | | No Data. |
| 39. Land Ban First Thirds | NA | NA | $696 (r=5.5%; n=20) | Toxic health effects averted over 70 years: 14,573 cases (or 208 cases annually). |
| 40. Land Disposal - Dioxin | $3.3 (n=20) | $3.6 (n=20) | | Insufficient Data. |
| 41. Cal. List - Land Disposal | NA | NA | $93 (r=7%; n=20) | Toxic health effects averted over 70 years: 2,299 cases (or 32.8 cases annually). |
| 42. UST Financial Responsibility | $290 (n=1) | $290 (n=1) | | No Data. |

| Regulation/Guideline | Annualized Costs at Alternative Capital Recovery Rates, r (Time period, n, used in analysis) r = 4% | r = 10% | Other | Reported Quantified Benefits/Effects |
|---|---|---|---|---|
| 43. UST Technical Standards | NA | NA | $210 (r=3%; n=30) | o Cancer Reductions-percentage of UST's with unit risks of greater than $10^{-6}$ to the most exposed individuals are reduced from 20 percent to 8 percent.<br>o Ecological Effects-15-40 percent of U.S. small streams spared potential serious damage.<br>o Estimated present value for property damage averted: $1,052 million (annualized: $53 million; r=3%, n=30).<br>o Estimated present value for corrective action costs avoided: $30,040 million (annualized: $1,532 million; r=3%, n=30). |
| 44. Hazardous Waste Tank Standards | $15.4 (n=20) | $21 (n=20) | | o Cancer and non-cancer health risks to exposed population reduced by 50 percent.<br>o Individual risks greater than $10^{-3}$ reduced by 80 percent. |
| 45. Small Quantity Generator | NA | NA | $74 (r=3%; n=10) | No Data. |
| 46. Waste Oil Management | NA | NA | $176 (r=13%; n=20) | o Unspecified cancers averted over 70 years: 8966 cases (or 128 cases annually).<br>o Lead poisoning cases averted over 70 years: 1700 cases (or 24.3 cases annually). |
| 47. National Contingency Plan | $913 (n=5) | $1,121 (n=5) | | No Data. |
| 48. CERCLA Settlement Policy | Negative Costs Expected | | | No Data. |
| 49. Title III of SARA | NA | $694 (n=11) | | No Data. |
| 50. Toxicity Characteristic | No Data | | | No Data. |

| Regulation/Guideline | Annualized Costs at Alternative Capital Recovery Rates, r (Time period, n, used in analysis) r = 4% | r = 10% | Other | Reported Quantified Benefits/Effects |
|---|---|---|---|---|
| 51. Subtitle C Location Standards | No Data | | | No Data. |
| 52. Corrective Action at SWMU | No Data | | | No Data. |
| 53. Land Ban for Soil and Debris | No Data | | | No Data. |
| **VI. DRINKING WATER** | | | | |
| 54. Total Coliform Rule | $100 (n=1) | $100 (n=1) | | No Data. |
| 55. Surface Water Treatment - Filtration | $324 (n=20) | $409 (n=20) | | o Episodic outbreaks of waterborne disease averted annually: 9,000 - 63,000 cases.<br>o Endemic waterborne diseases averted annually: 200,000 - 406,000 cases. |
| 56. VOCs in Drinking Water | $42.4 (n=20) | $59.3 (n=20) | | Unspecified cancers averted annually: 42 cases. |
| 57. SOCs in Drinking Water | $32.7 (n=20) | $45.4 (n=20) | | Unspecified cancers averted annually: 72 eases. |
| 58. IOCs in Drinking Water | $26 (n=20) | $32.9 (n=20) | | Unspecified cancers averted annually: 12 cases. |
| 59. Fluoride in Drinking Water | $3.1 (n=20) | $3.6 (n=20) | | Moderate and severe dental fluorosis cases averted annually: 300 - 500 cases. |
| 60. Lead and Copper MCL | $60.5 (n=20) | $75.1 (n=20) | | No Data. |
| 61. Corrosion Control | $211 (n=20) | $241 (n=20) | | o Annual savings in materials damage averted: $525 million. |

| Regulation/Guideline | Annualized Costs at Alternative Capital Recovery Rates, r (Time period, n, used in analysis) r = 4% | r= 10% | Other | Reported Quantified Benefits/Effects |
|---|---|---|---|---|
| 62. Radionuclides | $250 (n=20) | $327 (n=20) | | Lung and liver cancers averted annually: 105 cases. |
| 63. Disinfection | $41.7 (n=20) | $47.5 (n=20) | | No Data. |
| 64. Public Notification Rule | $ .9 (n=1) | $ .9 (n= 1) | | No Data. |
| 65. 34 MCLs | No Data | | | No Data. |
| **VII. GROUND WATER** | | | | |
| 66. Class I Underground Injection Wells | $5.3 (n=20) | $5.9 (n=20) | | No Data. |
| 67. Well-head Protection | No Data | | | No Data. |
| 68. Class II Underground Injection Wells | No Data | | | No Data. |
| 69. Class V Underground Injection Wells | No Data | | | No Data. |
| **VIII. SURFACE WATER** | | | | |
| 70. Construction Grants Program | $6,867 (n=20) | $9,513 (n=20) | | No Data. |
| 71. Secondary Treatment Waivers | Negative Costs Expected | | | No Data. |
| 72. Municipal Sewage Sludge | $29.1 (n=1) | $29.1 (n=1) | | No Data. |
| 73. Pretreatment | $50 (n=1) | $50 (n=1) | | No Data. |

| Regulation/Guideline | Annualized Costs at Alternative Capital Recovery Rates, r (Time period, n, used in analysis) r = 4% | r = 10% | Other | Reported Quantified Benefits/Effects |
|---|---|---|---|---|
| 74. Stormwater | $82.5 (n=20) | $88.7 (n=20) | | No Data. |
| 75. Sewage Sludge Management | $53.3 (n=20) | $59.8 (n=20) | | o Unspecified cancers averted annually: .57 cases.<br>o Unspecified non-cancer health effects averted annually: 129 - 524 cases. |
| 76. ELG: Foundries | $35.8 (n=10) | $39.5 (n=10) | | No Data. |
| 77. ELG: Placer Gold Mining | $4.9 (n=10) | $5.1 (n=10) | | No Data. |
| 78. ELG: Organic Chemicals | $496 (n=10) | $531 (n=10) | | o Unspecified cancers averted annually: .8 cases.<br>o Annual water quality and smog reduction benefits estimated as $220 - $441 million. |
| 79. ELG: Pesticides | $61.7 (n=10) | $67.1 (n=10) | | No Data. |
| 80. ELG: Machinery Manufacturing | No Data | | | No Data. |
| 81. ELG: Onshore Oil and Gas | No Data | | | No Data. |
| 82. ELG: Pulp and Paper | No Data | | | No Data. |
| 83. Non-Point Sources | No Data | | | No Data. |
| 84. Wetlands | No Data | | | No Data. |
| 85. National Estuary Program | No Data | | | No Data. |

| Regulation/Guideline | Annualized Costs at Alternative Capital Recovery Rates, r (Time period, n, used in analysis) r = 4% | r = 10% | Other | Reported Quantified Benefits/Effects |
|---|---|---|---|---|
| 86. Toxic Water Pollutants | No Data | | | No Data. |
| 87. Ocean Dumping | No Data | | | No Data. |
| 88. Incineration at Sea | No Data | | | No Data. |

# APPENDIX A

## 1. Stratospheric Ozone: Data summary

**Type of Action** -- Proposed regulation (52 FR 47489; December 14, 1987) to limit the use of chlorofluorocarbons that contribute to degradation of the earth's stratospheric ozone layer.

**Regulatory Option Considered** -- Propose a worldwide, 50 percent reduction in fully-halogenated chlorofluorocarbons (CFC's) phased in over the next ten years and a freeze on halons at 1986 levels beginning in 1992.

**Data Sources Used:**

A. "Regulatory Impact Analysis: Protection of Stratospheric Ozone, Volumes I and II", OAR, US EPA, December 1987.

**Raw Data on Costs and Benefits**

A. Costs (1985$)

Source A calculates social cost for the U.S. using surplus estimates of consumer welfare losses incurred as a result of the reduced availability and higher prices of CFC-based and halon-based products. To get at this, the analysis estimated the private costs associated with the use of alternative technologies and and materials for producing these products. Page 9-15 of Volume I reports the following social cost for the moderate stretch-out cost assumption:

Present value social cost over the time period 1989-2075 using a 2% discount rate = $29,220 million in 1985$. We converted this cost into 1986$ ($29,847) and then annualized at 2% over 87 years.

Annualized cost (r=2%;n=87): $29,847 x .024347 = $726 M/yr.

B. Benefits

1. Physical benefits:

Source A. Vol. I (pages 7-4 to 7-21) reports U.S. cases of nonmelanoma and melanoma skin cancers (and deaths from these cancers) as well as cases of cataracts for people born before the year 2075 under the no control option and under the regulatory proposal. We used these estimates in the following manner to calculate physical health benefits for people born before 2075:

a) nonmelanoma skin cancers (pg. 7-4): 153.687 million cases under the "no control" option less 3.336 million cases under the regulatory proposal = 150 million cases averted

-- nonmelanoma skin cancer deaths (pg. 7-7): 3.02 million cases under the "no control" option less 57,700 cases under the regulatory proposal = 2.962 million deaths averted.

**1. Stratospheric Ozone -- continued**

b) melanoma skin cancers (pg. 7-12): 782,100 cases under the no control option less 34,300 cases under the regulatory option = 747,800 cases averted.

-- melanoma skin cancer deaths (pg. 7-16): 186,900 deaths under the no control option less 7,900 deaths under the regulatory option = 179,000 deaths averted.

c) cataracts (pg. 7-21): 18.171 million cases under the no control option less 612,200 cases under the regulatory option = 17.55 million cases averted.

In addition to these health benefits, the RIA (pgs. 7-24 to 7-36) reports the following environmental benefits: reduced risks to marine organisms: reduced risks to agriculture; reduced degradation of polymers: and reduced sea level rise.

2. Monetized Benefits in 1985$ (health benefits for people born before 2075 and environmental benefits from 1988 to 2075 due to regulation):

a) Present value (2%) of nonmelanoma skin cancers averted (pg. 8-3) = $60.1 B.

-- Present value of nonmelanoma deaths avoided (pg. 8-5) = $5,978 B. (this assumes a 2 percent rate for discounting and a $3 M value of life that increases at the rate of increase in per capita income --1.7 percent per year).

b) Present value (2%) of melanoma skin cancers averted (pg. 8-8) = $1.11 B.

-- Present value of melanoma deaths avoided (pg. 8-10) = $371 B (same valuation assumptions as used for nonmelanoma deaths).

c) Present value of cataracts averted (pg. 8-12) = $2.57 B.

d) Present value (3%) of impacts on fin and shellfish due to increased radiation averted (pg. 8-15) = $5.5 B.

e) Present value (3%) of reduced impacts on major grain crops due to radiation averted (pg. 8-17) = $ 23.37 B.

f) Present value (3%) of reduced impacts on major crops due to increases in tropospheric ozone averted (pg. 8-19) = $12.4 B.

g) Present value (3%) of reduced impacts on polymers due to UV radiation increases averted (pg. 8-21) = $3.12 B.

h) Present value (3%) of reduced impacts on major coastal ports due to sea level rise averted (pg. 8-22) =$50.1 B.

**1. Stratospheric Ozone -- continued**

Total present value for environmental benefits are $94.49B. We converted this to an annualized benefit estimate:

Total annualized env. benefits (r=3%;n=87): $3,079M/yr.

## 2. Municipal Waste Combusters: Data Summary

**Type of Action** -- Advanced notice of proposed rulemaking (52 FR 25399; July 7, 1987). A preliminary assessment of air emissions from municipal waste combusters was made to determine how much they may contribute to public health risks and the potential costs of controlling these risks. This assessment was made in response to a petition for rulemaking filed by the Natural Resources Defense Council and the states of New York, Connecticut, and Rhode Island. Based on the assessment results, the EPA is examining the regulation of MWC emissions under CAA Sections 111(b) and (d).

**Regulatory Option Considered** -- The assessment considers the costs and benefits associated with a baseline scenario-- which considers the status quo in add-on control technology for both existing and planned facilities, and associated with a controlled scenario -- which considers uniform application of dry scrubbing technology combined with very efficient particulate collection devices for both existing and planned MWC facilities.

**Data Sources Used**

A. "Municipal Waste Combustion Study: Report to Congress*', OSWER, US EPA, June 1987.

B. Cost worksheets for three types of planned and existing MWC facilities-- RDF, mass burn and modular-- derived from the reports to Congress and discussions with Mike Johnston (OAQPS). Brett Snyder, EAB/OPPE, supplied this data.

**Raw Data on Costs and Benefits**

A. Costs (1986$)

Source B reported incremental annualized capital costs (r=10%;n=20) and annual O&M costs associated with the controlled scenario for planned and existing RDF, mass burn and modular facilities. We converted the annualized capital cost estimates into initial capital by multiplying it by the PV factor associated with r=10%;n=20 (8.5136). The sum of initial capital and annual O&M for all facilities are:

1. Total initial capital cost = $3,244.720 M
   a) existing facilities -- $ 615.344 M
   b) planned facilities -- $2,629.380 M

2. Total annual O&M cost = $ 137.702 M
   a) existing facilities -- $ 27.368 M
   b) planned facilities -- $ 110.334 M

Total capital cost for all facilities were then annualized by 4 percent over 20 years ($3,244.7 x .073582 = $238.7 M/yr.) and by 10 percent ($3,244.7 x .11746 = $381.1 M/yr.), respectively, and each added to average annual O&M costs:

**2. Municipal Waste Combusters --continued**

Annualized cost (r=4%;n=20): $238.7 + 137.7 = $376M/yr.
Annualized cost (r=10%;n=20): $381.1 + 137.7 = $518M/yr.

B. Benefits

1. Cancer Benefits

Source A reports the following annual cancer risk incidence for both existing and planned facilities under the baseline and controlled scenarios:

Baseline Scenario (pg. 86, Table 5-4): 4-60 cases/yr.
Controlled Scenario (pg. 87, Table5-5): .5-4 cases/yr.

Subtracting the endpoints of the annual cancer incidence range associated with controlled scenario from those associated with the baseline scenario yields:

3.5 - 56 cancers averted annually

2. Other benefits--non-cancer health benefits due to reduced exposure to lead and mercury, as well as materials damages benefits due to reduced exposures of hydrochloric acid are expected but were not quantified.

## 3.TSDF Air Standards: Data Summary

**Type of Action** -- Proposed rule (52 FR 3748; February 5,1987) which would set standards limiting VOC emissions from about 100 waste storage and treatment facilities (WSTF) that distill or strip solvents containing over 10% total organics and about 1300 treatment, storage and disposal facilities (TSDF) that manage RCRA wastes with over 10% total organics.

**Regulatory Option Considered** -- The option being considered includes various management practices for VOC emissions control including the use of emissions control and reclamation technology associated with incineration.

Source of Data Used

A. Fed. Reg. Vol. 52, No. 24 ( pgs. 3748 - 3765)

**Raw Data on Costs and Benefits**

A. Costs (1986$)

Source A (Pg. 3765, middle column, first paragraph) reports the following nationwide costs associated with the proposed rule:

| | | |
|---|---|---|
| Capital | -- | $ 35.3 M |
| Annual O&M | -- | $ 9.7 M |

The capital costs were annualized at an interest rate of 4% over 15 years ($35.3 x .089941 = $3.17 M) and at 10 percent interest rate ($35.3 x .131474 = $4.64), respectively, and added to annual O&M costs to calculate annualized costs:

Annualized costs (r=4%;n=15): $3.17 + $9.7 =$12.8M/yr.
Annualized costs (r=10%;n=15): $4.64 + $9.7= $14.3M/yr.

B. Benefits

Source A (pg. 3764, last Paragraph) reports the results of a preliminary cancer risk assessment for people living within 50 kilometers of WSTF. This scoping analysis suggests that proposed rule will reduce the maximum individual lifetime risk of cancer from WSTF operating at the upper bound emission rate from about $3.7 \times 10^{-3}$ to $2.6 \times 10^{-4}$. This would reduce annual cancer incidence from 0.34 cases per year to .028 cases per year. These results extrapolated to TSDF suggests that the proposed rule would reduce TSDF annual cancer incidence from .65 cases to .13 cases. Total nationwide annual cancers would thus be reduced from about 1 cancer per year to .16 case per year (.84 cancers/yr.).

## 4. Diesel Fuel Standards: Data Summary

**Type of Action** -- The EPA is evaluating the need to propose diesel fuel sulfur and aromatics standards.

**Regulatory Option Considered** -- The option under consideration involves a diesel fuel standard of .05 weight percent and an aromatics standard of about 20 volume percent for on-highway fuels.

**Data Sources Used:**

A. "A Study on Restriction of Sulfur and Aromatics Content of Highway Diesel Fuel", Bonner & Moore Management Science, Inc., June 24 1987.

B. "Diesel Fuel Quality Effects on Emission, Durability, and Performance" Energy and Resource Consultants and Sobotka, Inc., September 30 1985.

**Raw Data on Costs and Benefits**

A. Costs (1986$)

Source A (pg.3-1 to 3-3) reports that the annualized cost of controlling both sulfur and aromatics is $1.07 billion and the initial capital cost are $2.655 billion. The author of this source (Franklin Frederick) related to us that the annualized costs include capital costs amortized over 15 years using a capital recovery factor of .286, plus annual O&M costs. We used this information to back out average annual costs as follows:

.286 x $2.665 B = $759 m/yr annualized capital costs.
$1.07 B less $759 M/yr = $311 annual variable costs.

The raw data we used to find annualized costs at alternative capital recovery rates are:

Capital cost --- $2,655 M
Annual Cost --- $ 311 M

Capital costs were then annualized at 4 percent over 15 years ($2,655 x .089941 = $238 M) and by 10 percent over 15 years ($2,655 x .131474 = $349 M). Annualized capital costs at each rate of interest were then added to annual O&M costs to find total annualized costs:

Annualized cost (r=4%; n=15): $238 + $311 = $549 M/yr.
Annualized cost (r=10%:n=15): $349 = $311 = $660 M/yr.

**4. Diesel Fuel Standards--continued**

B. Benefits

Source A reports no information on benefits. Source B, however, suggests that fuel economy and maintenance benefits may be substantial.

## 5. Light Duty Truck and Heavy-Duty Engine $NO_x$ and Particulate Standards: Data Summary

**Type of Action** -- Final Rule (50 FR 10606; March 15,1985) setting $NO^x$ and particulate emission standards for light-duty trucks and heavy-duty engines.

**Regulatory Option Considered** -- $No_x$ standards: 1) 1988 and later model years light-duty trucks-- 1.2 or 1.7 grams per mile depending on vehicle test weight; 2) 1988 - 1990 model years heavy-duty engines-- 6. grams per brake horsepower; and 3) 1991 and later model years heavy-duty engines-- 5. grams per brake horsepower. Particulate Emission Standards for heavy-duty engines: 1) 1988-1990 model years-- .6 grams per brake horsepower; 2) 1991 -1993 model years--.25 grams per brake horsepower; and 3) 1994 and later model years--.1 grams per brake horsepower.

**Data Sources Used:**

A. Fed. Reg. Vol. 50, No.1: March 15, 1985 (pp. 10606-10708)

B. "Regulatory Impact Analysis: Oxides of Nitrogen Pollutant Specific Study and Summary and Analysis of Comments", US EPA, OAR/OMS. March 1985.

**Raw Data on Costs and Benefits**

A. Costs (1984$)

Source B reported undiscounted fixed costs (Research, Development and Testing costs) and annual variable costs (Hardware costs) for each No, and Particulate standard over each of the years 1986-1996. The page numbers for these are:

1) Light-duty trucks manufacturer cost: pg. 3-17
2) Heavy-duty engine manufacturer cost for 1988 $NO_x$ standard: pg. 3-26
3) Heavy-duty engine manufacturer cost for 1991 $NO_x$ standard: pg. 3-31
4) Heavy-duty diesel engine manufacturer costs for 1988 $NO_x$ standard: pg. 3-40
5) Heavy-duty diesel engine manufacturer cost for 1988 particulate standard: pg. 3-48
6) Heavy-duty diesel manufacturer cost for 1991 $NO_x$ standard: pg. 3-56
7) Heavy-duty diesel engine manufacturer cost for 1991 articulate standards: pg. 3-84
8) Heavy-duty diesel engine manufacturer cost for 1994 particulate standard: pg. 3-96

**5. Light-duty truck and heavy-duty engine $NO_x$ and particulate standards -- continued**

The total fixed and variable costs for the sum of these requirements were discounted using rates of 4 and 10 percent. The present value costs are:

a. PV @ 4% = $1,145 million
b. PV @ 10% = $ 886 million

These were put in 1986$, and then annualized at 4% over 11 years, and at 10% over 11 years, respectively:

Annualized cost (r=4%;n=11) : $1,145 x .114149 = $130 M/yr.
Annualized cost (r=10%;n=11): $ 886 x .153963 = $136 M/yr.

B. Benefits:

Source B (Pg. 4-48) reports the following reductions in annual individual cancer risks for the U.S. urban population in the year 1995:

| | |
|---|---|
| Base Scenario | $1.2 \times 10^{-6}$ to $6.2 \times 10^{-6}$ |
| Controlled Scenario | $0.8 \times 10^{-6}$ to $4.1 \times 10^{-6}$ |

Individual risk reduced = $.4 \times 10^{-6}$ to $3.9 \times 10^{-6}$

We multiplied this estimate of individual cancer risk reduced by an estimate of the U.S. urban population in 1985 (obtained from 1987 Statistical Abstract of the U.S.):

182.525 M x .0000004 -.0000039 = 73 - 711 cancers averted annually

## 6. Gasoline Marketing: Data Summary

**Type of Action--** Proposed Rule (52 FR 31162; August 19, 1987) to implement a vehicle-based program to control refueling emissions from gasoline-fueled light-duty vehicles, light-duty trucks, and heavy-duty vehicles. The proposed standard is 0.10 grams of vapor per gallon of dispensed fuel.

**Regulatory Option Considered--** Nationwide, on-board vehicle emissions control technology.

**Data Source Used:**

A. "Draft Regulatory Impact Analysis: Proposed refueling Emissions Regulations for Gasoline-Fueled Motor Vehicles, Volume I --Analysis of Gasoline Marketing Regulatory Strategies", US EPA, July 1987.

**Raw Data on Costs and Benefits**

A. Costs (1984$):

Source A. (pg. 3-1; Table 3-2) reports 1988 present value compliance costs (r=10%) for the years 1988-2020, reannualized to a constant stream of values ($150 M/yr). Annualized enforcement costs are estimated to be $100,000/yr. (pg. 2-69). We could not break this cost data down into fixed and variable cost components. The $150.1 M/yr. was then converted into 1986$: $158M/yr. This is the cost estimate reported in Table 1.

B. Benefits

1. Cancer benefits:

Source A. (pg. 2-62) reports annual cancer benefits from on-board control requirements. Reduced cancers are primarily from reduced exposures to benzene emissions and other VOCS in gasoline vapors. It is hypothesized that cancer of the kidney results from exposure to benzene emissions and leukemia results from exposures to gasoline vapors. It is assumed that the reduction in refueling emissions would reduce the sum of cancers from exposure to benzene emissions and gasoline vapors. Average reduction in cancers associated with the on-board vehicle control option are 48 cases per year (pg. 2-64).

2. Other benefits: significant atmospheric ozone reduction benefits as well as morbidity benefits are expected but were not quantified.

## 7. Lead Phasedown: Data Summary

**Type of Action--** Final Rule (50 FR 9386; March 7, 1985) limiting the lead content in domestically refined and imported gasoline.

**Regulatory Option Considered** -- The chosen option limits the allowable lead content in gasoline to 0.10 grams per gallon. The costs and benefits reported below are associated with this new standard assuming no misfueling.

**Data Sources Used**

A. "Costs and Benefits of Reducing Lead in Gasoline: Final Regulatory Impact Analysis", US EPA, OPA, February 1985.

B. Time-series Capital and variable cost data supplied by Hugh Pitcher (the author of the RIA) and compiled by Joel Sheraga of OPA.

**Raw Data on Costs and Benefits**

A. Costs (1983$)

1. Capital costs: Source B. reports that total capital costs are $322 M.

We annualized this at r=4% and n=8: ($322 x .148528 = $39.69 M) and at r=10% and n=8 ($322 x .187444 = $52.4 M).

2. Annual O&M Costs: Source B. reports the following O&M costs by year:

| Year | Cost |
|---|---|
| 1985 | $ 96.00 M |
| 1986 | 608.00 |
| 1987 | 558.00 |
| 1988 | 467.84 |
| 1989 | 439.84 |
| 1990 | 406.84 |
| 1991 | 379.84 |
| 1992 | 376.84 |

The present value of for O&M costs were computed at interest rates of 4 and 10 percent, respectively, and then re-annualized over the eight years using the capital recovery factors .148528 (r=4%;n=8) and .187444 (r=10%;n=8). The resulting annualized O&M cost estimates are:

$415 M/yr. (4%)
$412 M/yr. (10%)

**7. Lead Phasedown--continued**

3. Annualized Total Costs

Annualized capital and O&M costs calculated at 4 percent were then summed and translated into 1986$. The same procedure was applied to the costs annualized at 10 percent. The resulting estimates are:

Annualized costs (r=4%; n=8) = $499 M/yr.
Annualized costs (r=10%; n=8) = $510 M/yr.

B. Benefits

1. Source A (p. VIII-6) reports the following physical health benefits in the year 1986:

a) reductions in the number of children with blood lead levels above 15ug/dl: 1.726M

b) reductions in the number of adult male cases of hypertension: 1.804M

c) reductions in the number of adult male cases of mycardial infarctions: 5,305

d) reductions in the number of adult male strokes: 1,115

e) reductions in the number of adult male deaths: 5,160

2. Source A (p. VIII-23) reports the following monetized annual health, maintenance and fuel economy benefits for each of the years 1985-1992 in 1983$:

1985 - $2.744B
1986 - 7.930B
1987 - 7.590B
1988 - 7.232B
1989 - 6.919B
1990 - 6.649B
1991 - 6.635B
1992 - 6.358B

We calculated the present value of these benefits at 10 percent ($34,963M), re-annaulized this value over 8 years and converted it into 1986$:

Annualized benefits (r=10%;n=8): 6,997M/yr.

## 8. Lead NAAQS: Data Summary

**Type of Action/Status** -- The present lead NAAQS standard of 1.5 $ug/m^3$ is currently under review because new evidence indicates that health effects take place at lower exposure levels than were thought possible when the original NAAQS standard was promulgated.

**Regulatory Option Considered** -- The lead standard examined here is .5 $ug/m^3$, averaged quarterly.

**Data Sources Used:**

A. "Cost Assessment of Regulatory Alternatives for Lead NAAQS", OAQPS, US EPA, July 1985.

B. "Economic Impact Analysis of Alternative Lead NAAQS", Mathtech, Inc., Feb. 1987.

**Raw Data on Costs and Benefits**

A. Costs (1984$)

Source A, Table 1 (no page number given) reports the following costs in 1984$:

| | | |
|---|---|---|
| Capital | -- | $315.3M |
| Annualized | -- | $ 89.8M |

Bill Butlye of OAQPS, the author of the cost assessment, informed us that they used r=10% and n=15 years to amortize capital costs. We used this data to back out O&M costs (capital recovery factor associated with r=10%, n=15 = .13147 x $315.3M = $41.45M. Annualized cost of $89.8M less $41.45 = $48.35M annual O&M cost). The capital and O&M costs were then translated into 1986$:

| | | |
|---|---|---|
| Capital cost | -- | $332.8 M |
| Annual O&M cost | -- | $51 M |

Annualized capital costs were then calculated at interest rates of 4 percent ($332.8 x .089941 = $29.8 M/yr.) and 10 percent ($332.8 x .131474 = $43.5 M/yr.), respectively, and added to annual O&M costs to calculate total annualized costs:

Annualized cost (r=4%;n=15): $29.8 + $51 = $80.8 M/yr.
Annualized cost (r=10%;n=15): $43.5 + $51 = $94.5 M/yr.

B. Benefits--No benefit data was reported by either data source. The sector study profile indicates that no national estimate of health risks has yet been performed, but that in 1988 benefits analyses for the following effects will be performed:

**8. Lead NAAQS--continued**

1. reduced lead toxicity

2. reduced lead-induced IQ effects, associated improvements in lifetime earnings for children, and reduced remedial education costs.

3. reduced hypertension and associated adverse cardiovascular outcomes costs, and reduced mortality risks for adult males.

## 9. Particulate Matter NAAQS: Data Summary

**Type of Action--** Final rule (52 FR 24634: July 1, 1987) setting new primary and secondary national ambient air quality standards for particulate matter.

**Regulatory Option Chosen--** The final regulation includes:

1) Replacing total suspended particulates (TSP) as the indicator for ambient air quality with a new indicator that includes only those particles with an aerodynamic diameter of less than or equal to 10 micrometers ($PM_{10}$);

2) Replacing the 24-hour primary TSP standard with a 24-hour $PM_{10}$ standard of 150 $ug/m^3$ with no more than one expected exceedance per year;

3) Replacing the annual primary TSP standard with a 24-hour and annual $PM_{10}$ standard of 50 $ug/m^3$, expected annual arithmetic mean; and

4) Replacing the secondary standard with 24-hour and annual $PM_{10}$ standards that are identical in all respects to the primary standards.

Compliance cost estimates were calculated assuming full as well as partial compliance with these requirements. We focused on the partial compliance situation (Scenario A) because the sector study profile suggests this is the most likely outcome.

**Data Sources Used**

A. "Regulatory Impact Analysis on the National Ambient Air Quality Standards for Particulate Matter", US EPA/OAQPS, December 1986.

B. "Regulatory Impact Analysis on the National Ambient Air Quality Standards for Particulate Matter", US EPA/OAQPS, February 21, 1984.

**Raw Data on Costs and Benefits**

A. Costs (1984$)

Source A. (pg. 11-20) reports 1983 present value compliance costs (r=10%) for the years 1989-1995 associated with the partial compliance scenario of $ 1,015 M. We converted this 1983 PV cost into a 1988 PV cost ($1,015 x 1.6105 = $1634) and converted it into 1986$ ($1,724 M). This was then annualized using an interest rate of 10 percent over 7 years:

Annualized cost (r=10%;n=7): $1724 x .2054055 = $353 M/yr.

**9. Particulate Matter NAAQS--continued**

This is the only cost estimate reported in Table 1. We could not disaggregate the cost data into capital and annual components and thus were unable to provide annualized costs at 4 percent.

B Benefits

1. Physical benefits-- Source A (pg. 111-9) reports the following health benefits accruing over the years 1989-1995:

a) Statistical lives saved -- 2,700
b) Lost work days averted -- 2.8 M
c) Reduced activity days averted -- 17.2 M
d) Cases of chronic respiratory disease averted -- 1 M
e) Cases of acute respiratory disease averted -- 3.9 M

2. Monetized Benefits-- Source A (pg. 111-7) reports the 1983 present value for the above health benefits as $3.8 -$11.2B. We converted this value into 1986$ ($4.01 - $11.821B) and then annualized it at ten percent over seven years:

Annualized benefits (r=10%;n=7): ($4.01 - $11.821B) x 0.2054055 = $823 - 2,428M

## 10. PCE NESHAP--Dry Cleaners: Data Summary

**Type of Action--** The chlorinated solvents project--an interagency task force--is currently examining interagency strategies for mitigating the health risks associated with the use of chlorinated solvents in various applications. An options selection paper has been prepared that examines the option for reducing the ambient and occupational health risks associated with the use of perchloroethylene (PCE) solvent in the dry cleaning industry through regulatory action under Section 112 of the Clean Air Act.

**Regulatory Option Considered--** The cost and benefit data presented below are associated with the Alternative B regulatory option. This option would require ambient controls on dry cleaning equipment (installation of refrigerated condensers and carbon absorbers on machines) and the immediate replacement of all Transfer-type dry cleaning machines with Dry-to-Dry machines.

**Data Sources Used**

A. "Options for Regulating PCE emissions in the Dry Cleaning Industry: A Cost-Benefit Analysis", Draft Report, ICF, Inc., November 11, 1987.

**Raw Data on Costs and Benefits**

A. Costs (1986$)

Source A (pg. 75; Table 25) reports total present value (r=6%;n=15) for compliance costs associated with Alternative B as $234 M. We annualized this present value costs using an interest rate of 6 percent over 15 years:

Annualized costs (r=6%;n=15): $234 x .102963 = $24.09 M/yr.

This is the only annualized cost estimate for PCE NESHAP provided in Table 1. We could not disaggregate the cost data into fixed and variable components and thus were unable to calculate annualized costs using an interest rate of 4 percent.

B. Benefits

Source A (pg. 75; Table 25) reports total cancers avoided due to reduced occupational and ambient exposures of PCE for alternative B: 83 cases over 15 years.

## 11. NSPS Woodstoves: Data Summary

**Type of Action** -- Proposed rule (52 FR 4994; Feb. 18, 1987) setting standards to limit particulate matter (PM) emissions from new residential wood heaters.

**Regulatory Option Considered** -- The Scenario A standards were used for the cost calculations. These standards would require catalytic wood heaters manufactured on or after July 1, 1988 be capable of limiting PM emissions to 4.1 grams/hour and non-catalytic heaters to 7.5 grams/hour.

**Data Sources Used:**

A. "Regulatory Impact Analysis: Residential Wood Heater New Source Performance Standards", US EPA/OAQPS, Dec. 1, 1986.

**Raw Data on Costs and Benefits:**

A. Costs (1985$)

Source A (pages 8-15 to 8-22) reports that Scenario A results in a net annualized savings of approximately $8 per heater due to improved heating efficiencies (which reduce fuelwood costs) and reductions in chimney cleaning costs.

B. Benefits

Source A (page 10-13) reports that Scenario A will produce mortality, morbidity and residential soiling benefits valued at $1.5 billion over five years (physical units of these benefits were not reported). Dividing this value by 5, and translating into 1986$ produces an annual benefit estimate of $306.

## 17. Radon: Data Summary

**Type of Action** -- Voluntary program designed to persuade homeowners to test for radon levels in homes and undertake to reduce exposures at levels above 4 picocuries per liter (pC/1).

**Regulatory Option Considered** -- The voluntary program would provide for federal information programs and assisting state programs to inform the public on the risks posed by radon exposure, how to test radon exposure levels in the home, and how to mitigate radon risks.

**Data Sources Used:**

A. "An Analysis of Radon Risks and Strategies for Their Reduction" Draft EPA/OPPE document (October 2, 1987).

B. Supplemental cost worksheets from Sam Napolitano of OPPE.

**Raw Data on Costs and Benefits**

A. Costs (1986$)

Source B reports 4 cost components:

1. First-year initial testing of all homes (58.9M homes at $20/home) = $1,179.46M.

2. Expanded first-year testing of homes with initial readings above 4 pC/1 (4.1M homes at $80/home) = $330.248M.

3. Subsequent annual retesting (over 73 years) of homes with initial readings above 4.1 pC/1 (4.1M homes at $20/home) = $82 M/year.

4. Present value (r=3%;n=74) cost of mitigation in homes with initial readings above 4 pC/1 = $24,432M. The sector study profile for radon indicates that about one-third of present value mitigation costs are for upfront capital costs, while the remainder are for annual O&M costs over 74 years. Thus, initial capital cost and present value O&M costs for mitigation are:

a) Mitigation capital cost -- $ 8,144M
b) Present value O&M cost -- $ 16,288M (or in annualized terms: $16,288 x capital recovery factor for r=3%;n=20 (.0337919) = $550 M/year).

**17. Radon --continued**

So total initial fixed and annual costs are:

Initial fixed Cost -- $9,653M ($1,509 M first-year testing cost plus $8,144 initial mitigation cost).

Annual Cost -- $632M ($82M annual retesting cost plus $550M annual O&M cost).

Annualized fixed costs were then calculated at an interest rate of 4 percent over 74 years ($9,653 x .0423235 = $408.53 M) and at an interest rate of 10 percent ($9,653 x 0.1000 865 = $966.13M), respectively, and added to annual costs to calculate total annualized cost:

Annualized cost (r=4%;n=74): $408M + $632M = $1,040 M/yr.
Annualized cost (r=10%;n=74): $966M + $632M = $1,598 M/yr.

B. Benefits

Source A (Page 41; Table 6) reports that after a new equilibrium is reached following mitigation measures (i.e. after mitigation strategies are achieving full benefits), the program will avert approximately 2500 cancers per year.

## 18. Radiofrequency Guidance: Data Summary

**Type of Action** -- Proposed rule (Fed. Reg. Vol. 41, No. 146; July 30, 1986) to limit the radiofreguencies of broadcast sources (i.e. radio and television) so as to reduce public exposure to radiation.

**Regulatory Option Considered** -- We used Option 1 (the most stringent option under consideration) for the cost analysis. This option limits AM radiofreguencies to 87 V/m and FM and TV radiofreguencies to $uW/cm^2$.

**Data Sources Used:**

A. "An Estimate of the Potential Costs of Guidance Limiting Public Exposure to Radiofreguency Radiation From Broadcast Sources", Vol. I Report for US EPA/ORP by the Lawrence LIvermore National Laboratories, July 1985.

**Raw Data on Costs and Benefits**

A. Costs (1984$)

Source A (Page 7; Table 1) reports that the mid-range present value cost (r=10%; n=5) for option 1 is $69.5M. This cost is made up almost entirely by one-time survey and retrofit costs. However, since these fixed costs are assumed to occur over a five year period, they were discounted to a present value estimate.

In order to use this cost estimate to produce annualized costs at different interest rates, we had to first eliminate the effect of the original discounting at 10 percent. To do this, we calculated an average annual fixed cost expenditure over each of five years by multiplying $69.5M by the present value factor for a uniform flow associated with r=10% and n=5 (3.79078):

Average annual fixed cost = $69.5 x 3.79078 = $18.33M/yr.

We then calculated annualized costs at 4 and 10 percent by first finding present values at these rates over five years:

PV Cost (r=4%;n=5): $18.33 X 4.45176 = $81.6M
PV Cost (r=10%;n=5): $18.33 x 3.79078 = $69.5M

These 1984$ present values were then converted into 1986$ and annualized at 4 and 10 percent, respectively, over 15 years:

$81.6 converted into 1986$ = $86.13
$69.5 converted into 1986$ = $73.36

Annualized cost (r=4%;n=15): $86.13 x .089941 = $7,74M/yr.
Annualized cost (r=10%;n=15): $73.36 x .131474 = $9.64M/yr.

**18. Radiofrequency Guidance -- continued**

B. Benefits

Source A reports that no data on proven health benefits associated with the rule are currently available.

## 19. Low-Level Radioactive Waste: Data Summary

**Type of Action --** Regulation currently under development (see ANPR 48 FR 45926; October 7, 1983) to set generally applicable standards for the management and disposal of Atomic Energy Act (AEA) low-level radioactive wastes (LLW) and high concentration naturally occurring accelerator-produced radioactive materials (NARM) wastes.

**Regulatory Option Considered --** The standard under consideration includes the following parts: 1) a general public exposure disposal standard: 2) a standard for predisposal management; 3) a groundwater protection standard: 4) a Below Regulatory Concern (BRC) criterion for radiation exposure from the unregulated disposal of very low activity LLW; and limits for the regulated disposal of certain non-AEA radioactive wastes containing NARM.

**Data Sources Used:**

A. "Low-Level and NARM Radioactive Wastes: Draft Environmental Impact Statement, Volume 2 -- Economic Impact Assessment", Office of Radiation Programs, US EPA, January 1987.

**Raw Data on Costs and Benefits:**

A. Costs (1985$)

Source A (pages 1-12 and 1-13) reports that the LLW standard, the BRC criterion, and the NARM limit are expected to result in an estimated a present value (r=10%;n=20) net saving of $327 - $890 million. The range reflects alternative assumptions regarding the way the Nuclear Regulatory Commission and the Dept. of Energy would ultimately implement the BRC criterion and the LLW standard. We converted this range into 1986$ ($334 - $909M) and annualized it at 10 percent over 20 years:

Annualized net savings (r=10%n=20): ($334 - $909) x .11746 = $39.23 - $106.77M/yr.

B. Benefits

Source A (page 1-14) reports that the rule could result in 73 health effects (fatal cancers and first-generation genetic effects) averted to 246 additional health effects over the next 10,000 years.

## 20. High-Level Radioactive Waste: Data Summary

**Type of Action --** Final rule (50 FR 38066; September 19, 1985) setting generally applicable standards for the management and disposal of spent nuclear fuel and high-level and transuranic radioactive wastes. The standards apply to management and disposal of such materials generated by the Nuclear Regulatory Commission (NRC) and to disposal of similar materials by atomic energy defense activities under the jurisdiction of the Dept. of Energy (DOE).

**Regulatory Option Considered --** Subpart A of the standards limits the radiation exposure of members of the public from the management and disposal of spent fuel, high-level or transuranic wastes prior to disposal at waste management and disposal facilities regulated by the NRC, and limits public radiation exposures from waste emplacement and storage operations at DOE disposal facilities that are not regulated by the NRC. Subpart B establishes the following types of requirements: 1) primary disposal standards for long-term containment that limit projected radiation releases to the accessible environment for 10,000 years after disposal; 2) limitations on exposures to individual members of the public for 1,000 years after disposal; and 3) a set of groundwater protection standards.

**Data Sources Used:**

A. "Final Regulatory Impact Analysis: 40 CFR Part 191 Environmental Standards for the Management of Spent Nuclear Fuel High-Level and Transuranic Wastes", Office of Radiation Programs, US EPA, August, 1985.

**Raw Data on Costs and Benefits:**

A. Costs (1984$)

Source A (page 3-1) says that there are substantial uncertainties regarding the costs of high-level radioactive waste management because: disposal sites have not been selected; operational facilities have not been built; some of the technologies for engineered barriers have not been fully developed and tested: and none of the waste management technologies have been put to full-scale production. Despite these sources of uncertainty, Source A (page 3-3; table 3-2) reports present value (r=10%;n=50) total costs associated with storage, transportation, encapsulation, waste form, repository construction and operation, research and development, government overhead, and decommissioning as $26.4 - $39.5 M in 1984$. Using the mid-point of this range ($33M), we converted to 1986$ ($34.83) and annualized at 10 percent over 50 years (see page 3-1 for a discussion of the 50-year time frame):

Annualized cost (r=10%;n=50): $34.83 x .100859 = $3.51 M/yr.

**20. High-Level Radioactive Waste -- continued**

B. Benefits

Source A reports that the benefits of the rule "consist of the general confidence these standards provide that management and disposal of these wastes will be accomplished with residual risks that are clearly very small". Since waste disposal is currently not done, there is no baseline cancer risk. The practice of disposing of radioactive wastes is expected to increase risks of cancer to the general population. The estimated number of cancer deaths resulting from disposal is 1,000 deaths nationwide over the next 10,000 years.

## 21. Large Volume Pesticides (EDB only): Data Summary

**Type of Action** -- Emergency suspension (49 FR 4452; February 22, 1984) of agricultural uses of the pesticide Ethylene Dibromide (EDB).

**Regulation Option Considered** -- Suspension on uses of EDB to fumigate soil, grain and grain milling equipment.

**Data Sources Uses:**

A. "Ethylene Dibromide: Position Document 4", Office of Pesticide Programs, US EPA, September 27, 1983.

**Raw Data on Costs and Benefits**

A. Costs (1982$)

Source A (page 84) reports that increased nematode control costs and losses in the value of production are $26 - $42.8M per year. We used the upper bound estimate on this range, as converted into 1986$: $48 M/yr. This is the annualized cost estimate reported in Table 1.

B. Benefits

Source A (page 72) reports the following EDB lifetime individual dietary cancer risks due to soil incorporation, wheat grain bulk fumigation and wheat grain machinery spot fumigation which we assumed are additive (following EPA risk assessment guidelines):

| | |
|---|---|
| Soil incorporation | $1.1 \times 10^{-5}$ |
| Bulk fumigation | $3.3 \times 10^{-3}$ |
| Spot fumigation | $2.4 \times 10^{-4}$ |
| Total | $3.55 \times 10^{-3}$ |

We then multiplied this total lifetime individual dietary risk by 240 million (reflecting the entire U.S. population) and divided this result by 70 (reflecting the average individual lifespan):

Total cancers reduced: .00355 x 240M = 852,000. 852,000/70 = 12,171.

The 12,171 estimate of annual cancers reduced is the number reported in Table 1.

## 22. Farmworkers: Data Summary

**Type of Action --** Proposed revisions to 40 CFR Parts 170 and 156 to upgrade worker protection standards relating to the use of agricultural pesticides.

**Regulatory Option Considered --** The proposed option includes the following requirements: 1) expansion of re-entry intervals; 2) new requirements for protective clothing: 3) information requirements: 4) notification requirements: 5) cleaning requirements: 6) medical treatment: 7) cholinesterase monitoring, and; 8) change in the scope of existing regulations to include workers employed in nurseries, greenhouses and forestry occupations.

**Data Sources Used:**

A. "Draft Regulatory Impact Analysis: Worker Protection Standards for Agricultural Pesticides", Office of Pesticide Programs, US EPA, December 8, 1987.

**Raw Data on Costs and Benefits**

A. Costs (1986$)

1. Incremental first-year compliance costs:

Source A (page 40) reports that first-year costs will be $169.9 M. Source A (page 26) also reports that beyond the first year costs will be somewhat lower because certain requirements will have a useful life of more than one year. However, as an upper bound estimate, we assume that the $169.9 M will be incurred annually for 20 years.

2. Costs to pesticide registrants:

Source A (page 29) reports that pesticide registrants will incur a one-time cost of $12 - $24 M.

3. Total costs of the rule:

Using the midpoint of the range for costs given in 2. above and the assumption for annual compliance costs, total fixed and annual costs are:

Initial Fixed Costs -- $18M
Annual costs -- $169.9M (over an assumed 20 years)

**22. Farmworkers -- continued**

To calculate annualized costs, we annualized fixed costs over 20 years at 4 percent ($18 x .073582 = $1.32M/yr.) and 10 percent ($18 x .11746 = $2.11M/yr.), respectively, and added these to annual costs:

Annualized cost (r=4%;n=20): $169.9 + $1.32 = $171.2 M/yr.
Annualized cost (r=10%;n=20): $169.9 + $2.11 = $171.0 M/yr.

B. Benefits

Source A (page 43) discusses the following unquantified benefits to pesticide applicators:

1. reduced lost work-time due to exposure;

2. reduced medical and insurance costs;

3. increased productivity from having a workforce less affected by pesticide poisoning.

## 23. Data Requirements: Data Summary

**Type of Action --** Final regulation setting requirements for the necessary data to register a pesticide.

**Regulatory Option Considered** -- Reference guidelines to assist pesticide manufacturers in providing the right testing information on the health and environmental effects of prospective pesticide products.

**Data Sources Used:**

A. "Regulatory Impact Analysis: Data Requirements for Registering Pesticides under Federal Insecticide, Fungicide and Rodenticide Act", Office of Pesticide Programs, US EPA, August 1982.

**Raw Data on Costs and Benefits**

A. Costs (1981$)

Source A (Page 120) reports the following annual costs of administering and complying with the reference guidelines:

| | | |
|---|---|---|
| Program costs | -- | $ 62.1M |
| Compliance costs | -- | $109M (midpoint of range $84 - $134) |
| Total annual cost | -- | $171.1M |

The $171.1 M/yr. total annual cost estimate was then converted into 1986$ ($207). This is the annualized cost estimate reported in Table 1.

B. Benefits

Source A reports that the data requirements will better enable the EPA to prevent registration of pesticides that pose unreasonable health and environmental risks, and remove from the market unreasonably dangerous pesticides. No quantified benefit data were reported, however.

## 27. Asbestos Ban/Phasedown: Data Summary

**Type of Action --** Proposed rule (51 FR 3738; January 29, 1986) to ban the commercial use of asbestos in certain products and to phase out the use of asbestos in all other products.

**Regulatory Option Considered --** Immediate ban on the manufacture, importation and processing of asbestos in construction products and a phase out of asbestos in other products. We used Alternative B, Low Decline Baseline Scenario for the cost and benefit data discussed below.

**Data Sources Used:**

A. "Regulatory Impact Analysis on Asbestos and Asbestos Products", Volume I Technical Report, ICF, Inc., August 1985.

**Raw Data on Costs and Benefits**

A. Costs (1986$)

Source A reported costs in present value terms only, and did not provide cost data disaggregated into capital and annual cost components. Page ES-11 (Exhibit 3A) reports the following present value gross domestic total cost discounted at 10 percent over the 20 year period 1987 - 2006 for Alternative B, Low Decline Baseline Scenario: $1,875.69 M. We annualized this present value cost over 20 years at 10 percent:

Annualized cost (r=10%;n=20): $1,875 x .11746 = $220 M/yr.

Since we could not disaggregate the cost data, it was not possible to calculate annualized costs using a 4 percent annualization rate.

B. Benefits

Source A (page ES-11) reports that Alternative B, Low Decline Baseline Scenario will reduce lung and mesothelioma cancers by 218.11 cases over the period 1987 - 2006. We divided this estimate by 20 to calculate annual cancers reduced: 10.9 cases.

## 28. Asbestos in Schools: Data Summary

**Type of Action --** Final rule (40 CFR Part 763; October 30, 1987) requiring school officials to inspect schools for asbestos-containing materials (ACM) and remove ACM when found.

**Regulatory Option Considered --** The rule pertains to all public and private elementary and secondary schools.

**Data Sources Used:**

A. "Final Schools Rule: Asbestos Hazard Emergency Response Act Regulatory Impact Analysis", Brian Muehling, Office of Toxic Substances, US EPA, September 1987.

**Raw Data on Costs and Benefits**

A. Costs (1985$)

Source A (pages 2 and 5) reports that estimated present value cost of the regulation calculated at 10 percent over 30 years is $3,145 M, and the present value cost at 4 percent over 30 years is $4,483 M. We converted these present values into 1986$ ($3,212 and $4,579) and then annualized these costs over 30 years at interest rates of 4 and 10 percent, respectively:

Annualized cost (r=4%;n=30): $4,579 x .05783 = $264 M/yr.
Annualized cost (r=10%;n=30): $3,212 x .106079 = $340 M/yr.

B. Benefits

Source A reports that it is expected that the rule will significantly reduce lung and gastrointenstinal cancers and mesothelioma cases. However, the RIA did not perform a risk reduction analysis.

## 29. Asbestos in Public Buildings: Data Summary

**Type of Action --** This is not a rule, but rather a report to Congress which evaluates the need and options for risk management controls relating to asbestos-containing materials in public buildings.

**Regulatory Option Considered --** The risk management option considered here involves the promulgation of a regulation similar to the asbestos in schools rule for asbestos testing and removal for all public buildings.

**Data Sources Used:**

A. "EPA Study of Asbestos-Containing Materials in Public Buildings: A Report to Congress", Draft Report, US EPA, October 1987.

B. "Final Schools Rule: Asbestos Hazard Emergency Response Act Regulatory Impact Analysis", Brian Muehling, Office of Toxic Substances, US EPA, September 1987.

**Raw Data on Costs and Benefits**

A. Cost (1986$)

Source A, Appendix 5 (Attachment 3) reports that total present value cost over 30 years at 10 percent is $51,200M. We then annualized this present value cost over 30 years at 10 percent to find annualized costs at this rate of interest. However, we were unable to identify the timing of the various cost components that contribute to total present value costs, and thus were unable to use this data to calculate annualized costs at 4 percent. We were, however, able to estimate an annualized cost at 4 percent using data on present value costs calculated at rates of 4 and 10 percent for the asbestos in schools rule. Source B reports that present value costs for the schools rule calculated at 4 percent over 30 years are 1.425 times the present value costs calculated at 10 percent over 30 years. Using this conversion factor, we estimate present value costs at 4 percent over 30 years for the public buildings control option as $72,960 ($51,200 x 1.425). With this new estimate we were able to calculate annualized costs over 30 years at interest rates of 4 and 10 percent, respectively, as follows:

Annualized cost (r=4%;n=30): $72,960 x .05783 = $4,219 M/yr.
Annualized cost (r=10%;n=30): $51,200 x .106079 = $5,431 M/yr.

**29. Asbestos in Public Buildings -- continued**

B. Benefits

Source A, Appendix 6 (page 8) reports that baseline risks of lung and gastrointestinal cancers and mesothelioma over 120 years associated with current asbestos exposures in public buildings for 30 years are 457 - 9145 cases for non-custodial occupations, where the lower end of the range is based on the assumption that fiber levels in public and commercial buildings are one-tenth those of schools, and the upper end of the range is based on the assumption that fiber levels are twice those of schools. Page 9 reports that cancer risks for custodial occupations, assuming an average asbestos exposure of 0.1 f/cc for 30 years, are 905 cases over 120 years. Summing the cancer cases over 120 years for non-custodial and custodial occupations yields: (457 - 9145) + 905 = 1,362 - 10,050 cases. Using the mid-point of this range as divided by 120 years produces an estimate of annual cancer risks of 47.55 cases per year. Source A reports that regulation of public buildings similar to the asbestos in schools rule could eliminate most of these cancer risks.

## 30. PCB's - Electrical Equipment: Data Summary

**Type of Action --** Final rule (47 FR 37342: August, 25, 1982) amending portions of the existing PCB rule to set new requirements for the authorized manufacture, processing and distribution of PCB's in electrical equipment as well prohibitions for their use.

**Regulatory Option Considered --** The final rule includes the following provisions: 1) prohibits the use of PCB transformers and PCB-filled electromagnets posing exposure risks to food or feed after October 1, 1985 and requires weekly inspections for such equipment in use before this time; 2) authorizes the use of all other transformers through their useful lives provided they are inspected quarterly; 3) authorizes the use of large PCB capacitors located in restricted access substations or indoor substations throughout their useful lives, and; 4) prohibits the use of all other PCB capacitors after October 1, 1988.

**Data Sources Used:**

A. Regulatory Impact Analysis of the Use Rule for PCB-Containing Electrical Equipment", Quenan & Schnitzer, July 1982.

**Raw Data on Costs and Benefits**

A. Costs (1981$)

Source A reports present value costs for each of the rule's requirements, including incremental inspection costs, PCB disposal costs, purchase and installation costs for new equipment and clean-up costs for spills, over 30 years at ten percent. By category, these present value costs are:

1. Outdoor, Non-Substation Capacitors (Pages 27 and 28; Table 3): present value cost of 6-year phaseout = $141.3 M less fuel savings of $105.7 M = $30.2 M total present value cost.

2. Transformers posing risk to food or feed ( Page 39; Table 9): present value cost of 3-year phaseout subject to weekly inspections = $14.41 M

3. Quarterly inspections for all other utility (Page 35; Table 7) and non-utility (Page 37; Table 8) PCB transformers:

Utility Transformers: present value cost = $28.8 M
Non-utility Transformers: present value cost = $47.9 M

Total present value costs (r=3%;n=30) for all requirements are thus: $30.2M + $14.41M + $28.8M + $47.9M = $121.31M. This cost was then converted into 1986$ ($147.23M) and then annualized over 30 years at 3 percent interest:

Annualized cost (r=3%; n=30): $147.23 x .051019 = $7.51 M/yr.

We were unable to disaggregate total present value costs into fixed and annual cost components, and thus were unable to provide annualized cost estimates at alternative rates of interest.

B. Benefits

Source A reports that the rule may result on significant cancer benefits. However, these benefits were not quantified. Instead, the RIA attempted to quantify benefits in terms of pounds of PCB releases avoided by the rule (see pages 45 -54 for this data).

## 31. Premanufacture Review Program: Data Summary

**Type of Action --** Final rule requiring manufacturers and importers of new chemicals (i.e. chemicals not listed on the TSCA Chemical Substances Inventory) to submit, at least 90 days prior to the date they intend intend to begin manufacturing or importing such chemicals, premanufacturing notice (PMN) data requirements.

**Regulatory Option Considered --** The PMN data provisions require sufficient data and information on the chemicals potential effects on human health and the environmental to allow the EPA to determine whether the commercial introduction of new chemicals will pose unreasonable risks.

**Data Sources Used:**

A. "Regulatory Impact Analysis for New Chemical Reporting Alternatives Under Section 5 of TSCA", ICF, Inc., May 10, 1983.

B. Historical time-series data on the number and type of PMN's submitted to the agency. Supplied by Jim Long, Office of Toxic Substances, US EPA.

**Raw Data on Costs and Benefits**

A. Costs (1981$)

1. EPA Costs -- Source A (page 65) reports the following costs for agency review of different types of PMN's, and the percentage of total annual PMN's falling in each of these categories (in parentheses):

Typical PMN -- $4,593 (95%)
Detailed Review chemical -- $65,393 (4.75%)
Section 5 controlled chemical -- $99,793 (.25%)

Source B shows that the number of valid PMN's submitted to the agency in the year 1987 was 1803. We used this number to figure the breakdown by type of PMN's submitted annually:

Typical PMN -- 1803 x .95 = 1713 per year
Detailed PMN -- 1803 x .0475 = 85 per year
Section 5 PMN -- 1803 x .0025 = 5 per year

**31. Premanufacture Review Program -- continued**

We used this breakdown and the cost data to calculate total annual cost for EPA review of PMN's:

| | |
|---|---|
| Typical PMN's -- 1713 x $4,593 = | $7.86M |
| Detailed PMN's -- 85 x $65,393 = | $5.57M |
| Section 5 PMN's -- 5 x $99,793 = | $0.49M |
| Total Annual EPA Cost | $13.92M |

2. Compliance Costs -- Source A reports that the costs to firms submitting PMN's are $5,400 - $12,700 per PMN. However, Jim Long (OTS/EPA) indicates that proposed and promulgated exemptions to the PMN data requirements have reduced compliance costs by 11 to 35%. Using the midpoint of this range (23%), we calculated new per PMN costs as $6,969 ($9,050 less $2,081). We then calculated average annual PMN compliance costs as follows: 1803 x $6,969 = $12.56M.

3. Total Cost -- Total average annual PMN costs were calculated by summing EPA review costs and firm compliance costs: $13.92 + $12.56 = $26.48M/yr. This annual cost was then converted into 1986$: $32.4M/yr. This is the cost estimate reported in Table 1.

B. Benefits

No data were reported on quantified benefits associated with the rule.

## 35. Subtitle D Criteria: Data Summary

**Type of Action --** Proposed rule to establish revisions to to RCRA Subtitle D criteria for municipal solid waste landfills. (This proposal is expected to be published in the Federal Register sometime in 1988.)

**Regulatory Option Considered --** The proposal establishes general facility standards, groundwater monitoring requirements, post-closure standards, and performance and operating requirements. The cost and benefit data discussed below are associated with the state point-of-compliance (POC) assumption.

**Data Sources Used:**

A. "Draft Regulatory Impact Analysis of Proposed Revisions to Subtitle D Criteria for Municipal Solid Waste Landfills", Prepared by Temple, Barker & Sloan for the US EPA, December, 22, 1987.

**Raw Data on Costs and Benefits**

A. Costs (1986$)

Source A (page V-15) reports that annualized costs (r=3%; n=20) of the proposed state POC including corrective action are $880 M/yr. The RIA did not, however, provide sufficient information to enable us to disaggregate the cost data into fixed and annual cost components. In order to calculate annualized costs at alternative rates of interest, we used a conversion factor suggested by Brett Snyder (EAB/OPPE) which was derived from discussions with OPPE solid waste analysts. This conversion factor says that 15% of annualized costs are represented by initial capital costs. Using this piece of information, we derived capital and annual O&M costs as follows:

Capital cost: .15 x $880 = $132; $132 X .067216 = $1,964M
Annual O&M cost: $880 less $132 = $748M/yr.

Using the above cost data, we calculated annualized capital costs over 20 years at interest rates of 4 percent ($1,964 x .073582 = $144M/yr.) and 10 percent ($1,964 x .11746 = $230M/yr.) respectively, and added these annualized capital costs to annual O&M costs to calculate total annualized costs:

Annualized cost (r=4%;n=20): $144 + $748 = $892 M/yr.
Annualized cost (r=10%;n=20): $230 + $748 = $978 M/yr.

**35. Subtitle D Criteria -- continued**

B. Benefits

1. Cancer risk reduction -- Source A (page V -100) reports that the rule will reduce cancers by approximately -0543 cases per year over 300 years (total cancers reduced over 30 years = 16.29) due to reduced groundwater contamination. Moreover, cancer risks will be reduced to the point where only 14 percent of landfills will pose maximum individual risks (MIR) of greater than $10^{-6}$, and virtually none will pose MIR greater than $10^{-5}$.

2. Resource damages averted -- Source A (page V-100) reports that the rule will save over $.98 billion worth of resource damages over 300 years in present value terms (r=3%). In annualized terms this savings is $310 M/yr.

## 36. Liner and Leachate Collection: Data Summary

**Type of Action** -- Final rule (50 FR 28702; July 15, 1985) establishing minimum technological requirements for new hazardous waste landfills and surface impoundments, and for replacements or extensions of existing landfills or surface impoundments.

**Regulatory Option Considered** -- The rule requires these units to have two or more liners and a leachate collection system. The leachate collection system must be between the top and bottom liners for surface impoundments and above the top and bottom liners for landfills.

**Data Sources Used:**

A. Cost Analysis for Final Rule Codification of RCRA Statutory Changes: The Solid Waste Disposal Amendments of 1984.

**Raw Data on Costs and Benefits**

A. Costs (1983$)

Source A (p.12) reports a total annualized cost (over 20 years at 3 percent) of $63.5M in 1983$ for the "most likely" estimate. We converted this into 1986$: $69.8M/yr. This is the annualized cost estimate reported in Table 1.

We could not disaggregate the cost data into fixed and variable cost components, and thus could not calculate annualized costs at alternative interest rates.

B. Benefits

No benefits data were reported.

## 37. Hazardous Waste Burning: Data Summary

**Type of Action --** Proposed rule (52 FR 16982; May 6, 1987) which establishes interim status and permit requirements for the burning and blending of hazardous wastes in boilers and industrial furnaces.

**Regulatory Option Considered --** The proposed rule would subject owners and operators of boilers and industrial furnaces to the general facility standards applicable to hazardous waste treatment, storage, and disposal facilities. The costs and benefit data reported below are associated with the base case scenario.

**Data Sources Used:**

A. "Draft Regulatory Analysis for Waste-as-Fuel Technical Standards: Proposed Rule", Industrial Economics, October 1986.

**Raw Data on Costs and Benefits**

A. Costs (1985$)

Source A (Exhibit p. 5-14) reports annualized social costs (over 15 years at 7 percent interest rate) of $8.2M. We converted this annualized cost into 1986$: $8.4M/yr. This is the cost estimate reported in Table 1.

We could not disaggregate the cost data into fixed and annual costs, and thus were unable to calculate annualized costs at alternative interest rates.

B. Benefits

Source A (p. 7-12) reports benefits from the base case scenario as a reduction in unspecified cancers over a 70 yr. time period from 18 cases to 15 cases (net reduction - 3 cases). These cancer benefits are equivalent to a reduction of .04 cases annually. Morbidity benefits are also expected but were not quantified.

## 38. Municipal Ash Standards: Data Summary

**Type of Action** -- Regulation under development to establish standards for the handling and disposal of municipal combustion ash.

**Regulatory Action Considered** -- Option not discussed.

**Data Sources Used:**

A. Information from Brett Snyder, supplied to him by Sharon Stahl (OPPE).

**Raw Data on Costs and Benefits**

A. Costs (1986$)

Source A reports average annual ash disposal costs for existing and planned facilities for three different facility types: RDF, modular, and mass burn.

Annual Costs (n=20)

| Type | Existing Facilities | Planned Facilities |
|---|---|---|
| RDF | $11.735M | $40.023M |
| Modular | $5.996M | $5.63M |
| Mass Burn | $22.919M | $116.338M |

Total - $202.641M

Total Average Annual Costs over a 20 year period = $202.641M. This is the cost reported in Table 1.

B. Benefits

No data were reported.

## 39. Land Ban - First Thirds: Data Summary

**Type of Action --** Proposed rule to establish land disposal restrictions for the first third of scheduled hazardous wastes.

**Regulatory Option Considered --** The proposed rule establishes concentration-based treatment standards for certain F and K wastes. In addition, EPA allows the soft hammer provisions to take effect for first third P and U wastes following Scenario B (which assumes that treatment capacity is available for all first third P and U wastes).

**Data Sources Used:**

A. "Regulatory Impact Analysis of the Proposed First Third Rule", Draft Report, Office of Solid Waste, US EPA, October 1987.

B. Personal communication with Mark Ralston of the Economic Analysis Staff (OSW).

**Raw Data on Costs and Benefits**

A. Costs (1986$)

Source A (page 7-2) reports that annualized incremental costs of the rule are $696 M/yr. Source B indicated that these annualized costs were calculated using a 5.5 percent rate of interest over 20 years. This is the annualized cost estimate reported in Table 1. We could not disaggregate the cost data into fixed and variable cost components and thus were unable to calculate annualized costs at alternative interest rates.

B. Benefits

Source A (page 6-10) reports that the proposed rule will reduce toxic health effects over a 70-year period by 14,573 cases (or 208 cases annually).

## 40. Land Disposal - Dioxin: Data Summary

**Type of Action --** Proposed rule (50 FR 1602) to restrict the land disposal of solvent dioxin wastes (F001 - F005 wastes) using risk-based screening levels for concentrations of toxic constituents in waste extracts.

**Regulatory Option Considered --** Under the final regulatory strategy, land disposal of dioxin-containing wastes will be allowed only under one or more the following conditions:

1) If extracts from the wastes as generated contain concentrations below specified levels for each of a number of toxic constituents;

2) If the wastes are treated to the point where extracts from the treatment residuals to be land disposed contain less than the specified containment concentrations, or:

3) If EPA grants a petition for variance from the provisions of the restrictions rule for a specific land disposal site, based on a demonstration that no migration of toxic contaminants will result from land disposal at that site.

**Data Sources Used:**

A. "Regulatory Analysis of Restrictions on Land Disposal of Certain Dioxin-Containing Wastes", Prepared by Industrial Economics for the Office of Solid Waste, US EPA, November 1986.

**Raw Data on Costs and Benefits**

A. Costs (1985$)

Source A (page 6-4) reports that rule will result in the following costs to generators or whoever pays the clean-up costs in the case of dioxin-containing wastes other than contaminated soils:

Initial one-time costs -- $8.2M
Annual costs -- $2.6M/yr.

We converted these cost components into 1986$ (Initial costs = $8.37M; Annual costs = $2.65M/yr.), annualized initial costs over 20 years at interest rates of 4 percent ($8.37 x .073582 = $.615M/yr.) and 10 percent ($8.37 x .11746 = $.983M/yr.) respectively, and added these annualized fixed costs to annual costs to calculate total annualized costs:

Annualized cost (r=4%;n=20): $.61 + $2.65 = $3.26 M/yr.
Annualized cost (r=10%;n=20): $.98 + $2.65 = $3.63 M/yr.

**40. Land Disposal: Dioxin -- continued**

B. Benefits

Source A (Chapter 8) qualitatively discusses the rule's potential to reduce cancer risks caused by ground, surface water, and air exposures.

## 41. California List Wastes -- Land Disposal: Data Summary

**Type of Action --** Final rule (52 FR 25760; July 8, 1987) implementing land disposal restrictions for California List Wastes.

**Regulatory Option Considered --** The final rule sets threshold concentrations levels equal to the statutory levels established by Congress. Wastes containing Cal. list constituents above these levels must be treated to below threshold levels or solidified, as appropriate, prior to land disposal.

**Data Sources Used:**

A. "Regulatory Impact Analysis of Restrictions on Land Disposal of California List Wastes", Office of Solid Waste, US EPA.

B. Personal communication with Mark Ralston of the Office of Solid Waste.

**Raw Data on Costs and Benefits**

A. Costs (1986$)

Source A (page 4-2) reports that the total annualized social cost of the rule is $93.7 M/yr. Source B indicates that this annualized cost was calculated using a 7 percent rate of interest over 20 years. This is the annualized cost estimate reported in Table 1. We were unable to disaggregate the cost data into fixed and variable cost components, and thus were unable to calculate annualized costs at alternative interest rates.

B. Benefits

Source A (page 7-2) reports that the rule will reduce toxic health effects over a 70 year period by 2,229 cases (or 32.8 cases annually).

## 42. UST Financial Responsibility: Data Summary

**Type of Action --** Proposed rule requiring owners and operators of Underground Storage Tanks (UST) to maintain evidence of financial responsibility for taking corrective action and compensating third parties for bodily injury and property damage caused by releases from USTs.

**Regulatory Option Considered --** SARA establishes a minimum amount of financial responsibility at $1 million per occurrence. The cost data reported are for Assumption #1: all firms that presently do not have insurance and do not qualify for self-insurance will be able to obtain insurance.

**Data Sources Used:**

A. "Regulatory Impact Analysis of Proposed Financial Responsibility Requirements for Underground Storage Tanks Containing Petroleum," Meridian Research Inc., March 30, 1987.

**Raw Data on Costs and Benefits**

A. Costs (1985$)

Source A (p. 4-11 to 4-17) reports total annual real resource costs of $284,6M/yr. We translated this figure into 1986$: $290.71 M/yr. This is the cost estimate reported in Table 1.

B. Benefits

Potential benefits are discussed in qualitative terms in the RIA (p. 6-1 to 6-3). Types of benefits include:

a. Resource allocation benefits;
b. Willingness to pay for distributional goals;
c. Reduced cost of cleanup and reduced health and environmental damage resulting from more timely reporting of releases;
d. Fewer releases from USTs; and
e. Reduced business disruptions.

## 43. UST Technical Standards: Data Summary

**Type of Action** -- Proposed rule (52 FR 12662; April 17, 1987) establishing requirements for leak detection, and leak prevention for underground storage tanks.

**Regulatory Option Considered** -- The option considered (Option 11) consists of requirements for manual inventory control, monthly leak detection installed within 3 years, corrosion protection for all new tanks, and upgrading to new tank standards within ten years.

**Data Sources Used:**

A. "Regulatory Impact Analysis for Proposed Technical Standards for Underground Storage Tanks," Sobotka and Company, March 30, 1987.

**Raw Data on Costs and Benefits**

A. Costs (1986$)

Source A (p. ES-7) reports incremental annualized costs (r=3%;n=30) for Option 2 prevention and detection as $210M/yr. This is the estimate reported in Table 1.

B. Benefits

Source A reports benefits in three categories:

1. Cancer reductions - (p. 7-7) Cancer risk reductions result from reduced ingestion of groundwater contaminated by gasoline released from USTs. Individual unit risk reductions (Most Exposed Individuals - MEI) were calculated, thus we cannot estimate the number of cancers reduced as a result of the regulation. Where exposure ends immediatly after detection of a leak but is not limited by the taste threshold, 20 percent of tanks have MEI risks greater than $10^{-6}$. Option II reduces these risks by 20 percent in the base case to 8 percent.

2. Welfare Effects - (PP. 7-20, 7-21) Property damages benefits result from avoiding well and vapor damages (estimated by combining replacement costs estimates with a damage function that relates UST leaks to well and vapor damages.) Property damages are reduced by an aggregate present value (3 percent, 30 years) of $1,591M in the base case to $539 M for Option II.

**43. UST Technical Standards -- continued**

3. Corrective Action Costs Avoided - Source A (p. ES-7) reports incremental annualized (r=3%;n=30) corrective action costs savings for Option 2 as $1.53M/yr.

4. Ecological Effects - (pp. 7-31, 7-32) The regulations will spare 15 to 40 percent of the nation's small streams potential serious damage from release discharges to surface water.

## 44. Hazardous Waste Tank Standards: Data Summary

**Type of Action --** Final rule (51 FR 25422: July 14, 1986) establishing standards for hazardous waste storage and treatment tank systems.

**Regulatory Option Considered --** The regulations address both design and operating standards by establishing tank installation requirements, secondary containment systems, tank integrity assessments, and inspection requirements.

**Data Sources Used:**

A. "Economic Analysis of RCRA Regulations for Hazardous Waste Tank Standards," Office of Solid Waste, US EPA, June 1986.

B. "Hazardous Waste Tank Risk Analysis", Draft Report, ICF Inc., June 1986.

**Raw Data on Costs and Benefits**

A. Costs (1985$)

Source A reports present value capital and annual O&M costs (r=13%;n=20) as $125.27M and $42.42M, respectively. We eliminated the effect of discounting to calculate capital and O&M costs and converted these into 1986$:

Capital cost -- $127.96M
Annual O&M cost -- $6.00M

We then calculated annualized capital costs over 20 years at interest rates of 4 percent ($127.96 x .073582 = $9.41M/yr.) and 10 percent ($127.96 x .117460 =$15.03 M/yr.), respectively, and added these to annual O&M costs to calculate total annualized costs:

Annualized cost (r=4%;n=20): $9.41 +$6.0 =$15.4M/yr.
Annualized cost (r=10%;n=20): $15.03 +$6.0 = $21M/yr.

B. Benefits

Source B (p. 5-33) estimated the reduction in health risks for exposed individuals only - data was not available for population exposed. Cancer and non-cancer health risks will be reduced by 50% by the rule. High risk situations (individual risks greater than $10^{-3}$) will be reduced by 80% with the regulation.

## 45. Small Quantity Generators: Data Summary

**Type of Action --** Final rule (51 FR 10146; March 24, 1986) regulating generators of hazardous waste producing between 100 and 1,000 kilograms per month.

**Regulatory Option Considered --** The promulgated rule institutes a uniform manifest, and Subtitle C management controls; requires small quantity generators to obtain an EPA identification number: and imposes a limited set of performance standards for 180 or 270 day storage.

**Data Sources Used:**

A. "Economic Analysis of Resource Conservation and Recovery Act Regulations for Small Quantity Generators," ICF Inc., June 1985.

**Raw Data on Costs and Benefits**

A. Costs (1984$)

Source A reported the following annualized costs (based on 3 percent interest rate over 10 years):

Costs of compliance: $57.944M/yr. (Ex. 4-16)
Annual Government Costs: $12.650M/yr. (Ex. 5-1)

Total annualized costs : $70.59M/yr. (1984$)

We translated this figure into 1986$: $74.50M/yr. This is the cost estimate reported in Table 1. We could not disaggregate the costs data into fixed and variable cost components, and thus could not calculate the annualized costs at alternative interest rates.

B. Benefits

No data on benefits were reported.

## 46. Waste Oil Management: Data Summary

**Type of Action --** Proposed regulation (50 FR 49258: November 29, 1985) to establish standards for used oil handling, recycling and disposal.

**Regulatory Option Considered --** The chosen option imposes modified hazardous waste regulations on all facilities in the used oil management system, including generators, intermediate facilities, and end users of used oil. Facilities generating less than 1,000 kilograms of used oil per month are exempted by the proposed rule.

**Data Sources Used:**

A. "Regulatory Impact Analysis of Proposed Standards for the Management of Used Oil", Temple, Barker & Sloan, Inc., November 1985.

B. Background Document for the RIA for Used Oil, November 1985.

**Raw Data on Costs and Benefits**

A. Costs (1984$)

Source A (p. 1-5) reports total annualized social costs as $167.1M/yr (using a 3 percent interest rate over 20 years). This estimate was converted into 1986$: $176M/yr. This is the cost estimate reported in Table 1.

We could not disaggregate the costs into fixed and variable components, and thus could not calculate annualized costs at alternative interest rates.

B. Benefits

Benefits are expressed in Source A as reductions in two categories of health effects:

1. Reduced Cancers: (p.1-8) reports benefits as 8966 unspecified cancers reduced over 70 years (8966/70 = 128.08 cancers reduced annually).

2. Morbidity: (p.1-8) The regulation will eliminate 1700 cases of lead poisoning over 70 years (1700/70 = 24.28 lead poisoning cases averted per year).

## 47. National Contingency Plan: Data Summary

**Type of Action --** Proposed revisions to the National contingency Plan (NCP). The NCP provides the guidelines, operating procedures, and responsibilities that define the appropriate responses to releases or threats of releases of any hazardous substance or pollutant that may present an imminent and substantial danger to human health or the environment.

**Regulatory Option Considered --** The NCP revisions propose changes to provisions pertaining to the selection of remedies that emphasize the use of treatment-based remedies and compliance with federal and state applicable requirements. The cost and benefit data reported below are based on the assumption that treatment will be the principal component of a remedy for 80 percent of the operating units for which ROD's will be signed during FY 1987 through FY 1991.

**Data Sources Used:**

A. "Regulatory Impact Analysis in Support of the Proposed Revisions to the National Oil and Hazardous Substances Pollution Contingency Plan", Prepared by ICF, Inc. for the US EPA, September 1987.

**Raw Data on Costs and Benefits**

A. Costs (1986$)

Source A (page 3-20) reports the following costs for the each year between FY 1987 and FY 1991:

FY1987 -- $ 471.8M
FY1988 -- $ 461.8M
FY1989 -- $ 617.2M
FY1990 -- $1305.4M
FY1991 -- $1174.6M

To calculate annualized costs, we calculated the present value for costs at 4 and 10 percent, respectively, and then annualized these present values at 4 and 10 percent over 5 years. The resulting annualized cost estimates are:

Annualized cost (r=4%;n=5): $913.8 M/yr.
Annualized cost (r=10%;n=5): $1,121 M/yr.

B. Benefits

Source A (page 3-23) qualitatively discusses the human health and environmental benefits associated with the proposed revisions.

## 48. CERCLA Settlement Policy: Data Summary

**Type of Action --** Interim policy (50 FR 4034; February 5, 1985) established for settlement negotiations.

**Regulatory Option Considered --** The interim policy includes guidelines and procedures designed to improve the probability of EPA and private parties agreeing to settlement terms in Superfund clean-up disputes.

**Data Sources Used:**

A. "Sector Study Profile: CERCLA Settlement Policy', Prepared by Tom Gillis (US EPA).

**Raw Data on Costs and Benefits**

A. Costs

Source A reports that costs of the settlement policy have not been estimated, but one can assume that some components of the settlement policy will result in cost savings.

B. Benefits

No data on benefits is provided by Source A.

## 49. Title III of SARA: Data Summary

**Type of Action --** Title III requirements are set out in four separate regulations which are in various stages of rulemaking. These include:

1) Final rule establishing emergency planning and release notification requirements (52 FR 13378; April 22, 1987);

2) Proposed rule setting toxic chemical release reporting requirements (52 FR 21152; June 4, 1987);

3) Proposed rule setting trade secrete claims for emergency planning and right-to-know information requirements (52 FR 38312; October, 15, 1987), and:

4) Final rule setting emergency and hazardous chemical inventory forms and community right-to-know reporting requirements (52 FR 38344: October 15, 1987).

**Regulatory Option Considered --** The above final and proposed rules set out various requirements for chemical reporting and emergency planning and release notification.

**Data Sources Used:**

A. "Title III SARA Supplemental Briefing Package: Economic Impacts", December 11, 1987.

**Raw Data on Costs and Benefits**

A. Costs (1986$)

Source A (page 2) reports that total present value costs (r=10%;n=11) to industry are $4,000M and costs to farms are $77M. Source A (page 17) also reports that the present value (r=10%; n=11) costs to EPA, states and local governments and fire departments are $431M. To calculate total annualized costs, we first added the costs to the various sectors ($4,000M + $77M + $431M = $4,508M) and then annualized this estimate over 11 years at 10 percent interest:

Annualized cost (r=10%;n=11): $4,508 x .153963 = $694 M/yr.

We were unable to disaggregate the cost data into fixed and variable cost components, and thus were unable to calculate annualized costs at alternative rates of interest.

B. Benefits

Source A reported no data for benefits.

## 54. Total Coliform Rule: Data Summary

**Type of Action --** Proposed regulation (52 FR 42224; November 3, 1987) to amend the maximum contaminant levels (MCLs) for total coliform bacteria in all public water systems.

**Regulatory Option Considered --** The option involves the amendment of MCLs for total coliform bacteria. The proposed MCL is determined simply by the presence or absence of coliform bacteria in a percentage of the samples, rather than by the density, and by the frequency of sampling. EPA is reproposing the MCLG of zero and a limit for heterotrophic bacteria. The rule also proposes monitoring requirements and analytical methodology.

**Data Sources Used:**

A. "PWS Program: Total Impact of the 1986 SDWA Amendments", US EPA/Office of Drinking Water, December 1, 1987.

B. "Regulatory Impact Analysis: Benefits and Costs of Proposed Surface Water Treatment Rule and Total Coliform Rule", US EPA/Office of Drinking Water, September 1, 1987.

**Raw Data on Costs and Benefits**

A. Costs (1986$)

All costs under the proposed Coliform Rule are due to monitoring. Source A reports that the annual monitoring costs are $100M/yr.

B. Benefits

Neither Source A or B reports quantified benefits. Source B reports that the rule is expected to reduce waterborne disease.

## 55. Surface Water Treatment - Filtration: Data Summary

**Type of Action --** Proposed rule (52 FR 42178; November 3, 1987) setting Maximum Contaminant Level Goals (MCLGs) for Giardia lamblia viruses and Legionella and national primary drinking water regulations for public water systems using surface water sources.

**Regulatory Option Considered --** In addition to setting MCLGs of zero for Giardia lamblia viruses and Legionella, the regulation proposes a treatment technique in lieu of an MCL for the contaminants. The option also proposes filtration and disinfection requirements, criteria, and procedures by which the State would determine which systems must comply with the regulation.

**Data Sources Used:**

A. "Regulatory Impact Analysis: Benefits and Costs of Proposed Surface Water Treatment Rule and Total Coliform Rule," Wade Miller Assoc., September 1, 1987.

B. "PWS Program: Total Impact of the 1986 SDWA Amendments," EPA/ODW, December 1, 1987.

**Raw Data on Costs and Benefits**

A. Costs (1986$)

According to Source B, total capital costs associated with the rule are $1,946M and annualized costs (at 3% over 20 yrs.) are $311M. We used this data to back out the annual O&M costs: .067216 x $1,946M = $130.8M annualized capital cost. Annualized total costs of $311M less $130.8M = $180.2M annual O&M costs.

Capital cost -- $130.8M
Annual O&M cost -- $180.2M

We then calculated annualized capital costs at interest rates of 4 percent ($1,946M x .073582 = $144M) and 10 percent ($1,946M x .117460 = $228.5M), respectively, and added each of these to the annual O&M costs to calculate total annualized costs:

Annualized costs (r=4%;n=20): $180.2M + $144M = $324M
Annualized costs (r=10%;n=20): $180.2M + $229M = $409M

55. Surface Water Treatment -- continued

B. Benefits

Source A (pp. 5-9 to 5-10) reports quantified benefits in terms of the total number of cases of waterborne disease avoided per year using the following data:

| | Unfiltered Systems | |
|---|---|---|
| | Upper Bound | Lower Bound |
| Outbreak | 27,584 | 6,530 |
| Endemic | 136,494 | 68,247 |
| Total | 164,078 | 74,777 |
| | Filtered Systems | |
| | Upper Bound | Lower Bound |
| Outbreak | 35,159 | 2,653 |
| Endemic | 269,543 | 134,772 |
| Total | 304,702 | 137,425 |

Subtracting the estimates for filtered systems from the estimates for unfiltered systems suggests that approximately 9,000 to 63,000 cases of episodic outbreaks of waterborne disease will be averted annually and approximately 200,000 to 406,000 cases of endemic waterborne diseases will be averted annually.

## 56. VOCs in Drinking Water: Data Summary

**Type of Action** -- Final regulation (52 FR 25690; July 8, 1987) establishes maximum contaminant levels (MCLs), monitoring, and public reporting requirements for eight volatile organic compounds (VOCs) in drinking water.

**Regulatory Option Considered** -- The MCL established for most of the 8 VOCs is 5 ug/l.

**Data Sources Used:**

A. "Economic Impact Analysis of Proposed Regulations to Control Volatile Synthetic Organic Chemicals (VOCs) in Drinking Water", US EPA/ODW, October 1985, as amended May 19, 1987.

B. Fed. Reg. Vol. 52, No. 130, July 8, 1987, pp. 25690-25717.

C. "PWS Program: Total Impact of 1986 SDWA Amendments," US EPA/ODW, December 1, 1987.

**Raw Data on Costs and Benefits**

A. Costs (1986$)

Source C reports total capital cost of $385M associated with the rule. The source also reports an annualized cost (at 3%;20 yrs.) of $40M. We used this data to back out O&M costs (.067216 x $385M = 25.9M annualized capital cost.) Annualized total cost of $40M less $25.9M = $14.1M annual O&M costs.

Capital cost -- $385M
Annual O&M cost -- $14.1M

Annualized capital costs over 20 years were then calculated at interest rates of 4 percent ($385M x .073582 = $28.3M/yr.), and 10 percent ($385M x .117460 = $45.2M/yr.), respectively, and added to the annual O&M costs to calculate total annualized costs:

Annualized cost (r=4%;n=20): $28.3M + 14.1M = $42.4M/yr.
Annualized cost (r=10%;n=20): $45.2M + 14.1M = $59.3M/yr.

B. Benefits

Source C reports regulatory benefits of 42 cases of unspecified cancer averted annually.

## 57. SOCs in Drinking Water: Data Summary

**Type of Action--** Regulation, under development, will establish maximum contaminant levels (MCLs) and monitoring requirements for certain synthetic organic chemicals (SOCs) in drinking water. The regulation is presently in draft form.

**Regulatory Option Considered--** The draft proposed MCLs vary from a low of 0.0005 ug/l for chlordane, to a high of 2000 ug/l for Toluene.

**Data Sources Used:**

A. "PWS Program: Total Impact of 1986 SDWA Amendments", US EPA/ODW, December 1, 1987.

B. "Draft Regulatory Impact Analysis of Proposed Synthetic Organic Chemicals," US EPA, Office of Drinking Water, August 17, 1987, and revisions of October 13, 1987 to Chapter IV.

**Raw Data on Costs and Benefits:**

A. Costs (1986$)

Source A reports total capital costs of $288M and annualized costs of $31M (at 3%;20yrs.) We used this data to back out the O&M costs associated with the rule: .067216 X $288M = $19.35M annualized capital cost. Annualized total cost of $31M less 19.35M = $11.6M annual O&M costs.

Capital cost -- $288M
Annual O&M cost -- $11.6M

Annualized capital costs over 20 years were then calculated at interest rates of 4 percent ($288M x .073582 = $21.1M/yr.) and 10 percent ($288M x -117460 = $33.82M/yr.), respectively, and added to annual O&M costs to calculate total annualized costs:

Annualized cost (r=4%;n=20): $21.1 + $11.6 = $32.7M/yr.
Annualized cost (r=10%;n=20): $33.8 + $11.6 = $45.4M/yr.

B. Benefits

Source A reports benefits of 72 cases of unspecified cancer averted annually. Source C attributes virtually all of the benefits to the control of EDB.

## 58. IOCs in Drinking Water: Data Summary

**Type of Action --** Proposed rule (50 FR 46902; November 13, 1985) to establish new maximum contaminant levels (MCLs) for eight Inorganic chemicals (IOCs).

**Regulatory Option Considered--** The proposed rule would set levels ranging from a low of 3 ug/l for Mercury to a high of 10,000 ug/l for Nitrate. Our analysis only considers the preferred MCLs (most closely corresponding to MCLGs) for only three chemicals ( arsenic, cadmium, and copper) because these are the only three chemicals where the costs for the preferred MCL are larger than costs of existing regulation.

**Data Sources Used:**

A. "PWS Program: Total Impact of the 1986 SDWA Amendments," US EPA/ODW, December 1, 1987.

B. "Regulatory Impact Analysis of Proposed Inorganic Chemical Regulations," Wade Miller Assoc. for US EPA, November 1987.

**Raw Data on Costs and Benefits:**

A. Costs (1986$)

Source A reports total capital costs of $158M and annualized costs (at 3%;20yrs.) of $25M. We used this data to back out O&M costs: .067216 x $158M =$10.62M annualized capital costs. Annualized total cost of $25M less $10.62M = $14.38M annual O&M cost.

Capital cost -- $158M
Annual O&M cost -- $14.38M

Annualized capital costs over 10 years were then calculated at interest rates of 4 percent ($158M x .073582 = $11.62M/yr.) and 10 percent ($158M x .117460 = $18.55M/yr.), respectively, and added to annual O&M costs to calculate total annualized costs:

Annualized cost (r=4%;n=20): $14.38M + 11.62M = $26M/yr.
Annualized cost (r=10%;n=20): $14.38M + $18.55M = $32.93M/yr.

B. Benefits

Source A reports benefits as 12 unspecified cancer cases avoided annually.

## 59. Flouride in Drinking Water: Data Summary

**Type of Action** -- Final rule (52 FR 11396; April 2, 1986) establishing a maximum contaminant level (MCL) for flouride in drinking water.

**Regulatory Option Considered** -- The rule sets the MCL for flouride at 4 mg/l.

**Data Sources Used:**

A. "Economic Assessment of Reducing Flouride in Drinking Water," Abt Association Inc., November 1985.

B. Fed. Reg. Vol. 51, No. , pp. 11396-11412, April 2, 1986.

C. "PWS Program: Total Impact of 1986 SDWA Amendments," US EPA/ODW, December 1, 1987.

**Raw Data on Costs and Benefits:**

A. Costs (1986$)

Source C reports total capital costs of $12M and annualized costs of $3M (at 3% over 20 yrs). We used this information to back out the annual O&M costs: .067216 x $12M = $.8M/yr. annualized capital cost. Annualized total cost of $3M less $.8M = $2.2M annual O&M cost.

Capital cost -- $12M
Annual O&M cost -- $2.2M

We then calculated annualized capital costs over 20 years at interest rates of 4 percent ($12M x -073582 = $.88M/yr.) and 10 percent ($12M x .117460 = $1.4M/yr.), respectively, and added annual O&M costs to calculate total annualized costs:

Annualized cost (r=4%;n=20): $.88M + $2.2M = $3.1M/yr.
Annualized cost (r=10%;n=20): $1.4M + $2.2M = $3.6M/yr.

B. Benefits

Source A (p. 5) reports benefits of the rule as 300 to 500 cases of moderate and severe dental flourosis avoided per year.

## 60. Lead and Copper MCL: Data Summary

**Type of Action --** Regulation, under development, to make the current lead MCL of 50 ug/l more stringent and to propose a copper MCL.

**Regulatory Option Considered --** The preferred MCL options are 5 ug/l for lead and 1300 ug/l for copper.

**Data Sources Used:**

A. "RIA of Proposed National Primary Drinking Water Regulations for Lead and Copper" (draft), Wade Miller Assoc., Inc., June 1, 1988.

**Raw Data on Costs and Benefits:**

A. Costs ($1986)

1. Source A reports treatment and waste disposal costs associated with the preferred copper and lead MCLs (p. 4-2):

Capital cost -- $333M
Annual O&M cost -- $35M

2. Source A also reports monitoring costs for both MCLs (p. 4-8) as $1M/yr.

Annualized capital costs over 20 years were then calculated at interest rates of 4 percent ($333M x .073582 =$24.5M/yr.) and 10 percent ($333M x .117460 = $75.1M/yr.), respectively, and added to annual O&M costs to calculate total annualized cost:

Annualized costs (r=4%;n=20): $36M + $24.5 = $60.5M/yr.
Annualized costs (r=10%;n=20): $36M + $39.1M = $75.1M/yr.

B. Benefits

Source A expects significant health benefits to children, including reduced risks of impaired cognitive development. These benefits, however, were not quantified in the RIA. Unquantified benefits to adults are also expected in the form of reduced hypertension and reduced occurrence of reproductive abnormalities.

## 61. Corrosion Control: Data Summary

**Type of Action --** Regulation, under development, to require drinking water suppliers to install certain corrosion control treatments (including pH adjustment, carbonite, alkalinity adjustment, and corrosion inhibitors). The regulation also will include monitoring and public education requirements depending on water quality characteristics and EPA's judgements regarding the efficacy of treatment techniques.

**Regulatory Option Considered --** The base case option requires drinking water suppliers to install corrosion control treatment in all systems that exceed no-action levels for pH, alkalinity, or average lead content.

**Data Sources Used:**

A. "RIA of Proposed National Primary Drinking Water Regulations for Lead and Copper" (draft), Wade Miller Assoc., Inc., June 1, 1988.

**Raw Data on Costs and Benefits:**

A. Costs (1986$)

Source A (p. 4-27) reports costs as:

Capital cost -- $674M
Annual O&M cost -- $162M

We used this information to calculate annualized capital costs over 20 years at rates of 4 percent ($674M x .073582 = $49.6M/yr) and 10 percent ($674M x .117460 = $79.2M), respectively, and added annual O&M costs to these to calculate total annualized costs:

Annualized cost (r=4%;n=20): $49.6M + $162M = $211.6M
Annualized cost (r=4%;n=20): $79.2M + $162M = $241.2M

B. Benefits

Source A (p. 5-5) reports that 138 million persons will benefit from reduced drinking water lead exposures as a result of corrosion control treatment and an additional 30 million persons will benefit through public education. Additionally, annual savings in material damages averted will amount to $525M/yr.

## 62. Radionuclides: Data Summary

**Type of Action --** Advance Notice of Proposed Rulemaking (51 FR 34836: September 30, 1986) to establish MCLs and monitoring and public reporting requirements for certain radionuclides.

**Regulatory Option Considered --** EPA is considering alternative MCLs ranging from 1,000 pci/l to 160 pci/l. We used an MCL of 300pci/l for estimation purposes.

**Data Sources Used:**

A. "PWS Program: Total Impact of 1986 SDWA Amendments", US EPA/ODW, December 1, 1987.

B. "Preliminary Radon Summary Impacts Table", April 12, 1988 from Dave Schnare, Office of Drinking Water, US EPA.

**Raw Data on Costs and Benefits:**

A. Costs (1986$)

Costs are reported in Source B for community supplies only. Total annualized treatment costs range from $48M to $354M and annualized monitoring costs are reported as $.7M to $1.0M. According to Dave Schnare annual O&M costs are approximately equal to annualized capital costs. This implies that one half of the annualized treatment costs are annual O&M costs, and the other half consists of annualized capital costs (at 3% over 20 years). We calculated that total annual O&M costs range from $24M to $177M. Capital costs range from ($24M to $177M) x (present value factor) 14.8775 = $357M to $2,633M. Annual monitoring costs range from $.7M to $1M.

We also summarized costs from Source B associated with an MCL equal to 300 pci/l (the midpoint of our range of data points). Using the same assumption of the division of costs between O&M and capital costs as above, we calculated total capital costs = $119M x 14.8775 (present value factor) = $1,770M.

Capital costs = $1,770M
Annual O&M costs =$120M

Annualized capital cost estimates of the option (300pci/1) were then calculated at capital recovery rates of 4 percent ($1,770M x .073582 = $130M) and 10 percent ($1,770M x .117460 = $207M), respectively, and added annual O&M costs to calculate the total annualized costs:

**62. Radionuclides - continued**

Annualized cost (r=4%;n=20): $120M + $130M = $250M/yr.
Annualized cost (x=10%;n=20):-$120M + $207M = $327M/yr.

B. Benefits

Source B reported benefits for the range of values (1000 to 160 pci/l) as 29 to 135 cases of cancer cases avoided per year. For the 300 pci/l MCL option the source reports 105 cancer cases avoided per year.

## 63. Disinfection: Data Summary

**Type of Action--** Advance Notice of Proposed Rulemaking (48 FR 455502; October 5, 1983) to establish maximum contaminant levels (MCLs) for disinfection in drinking water.

**Regulatory Option Considered --** Option will establish MCLs, monitoring, and public reporting requirements for disinfection and disinfection by-products in drinking water.

**Data Sources Used:**

A. "PWS Program: Total Costs of 1986 SDWA Amendments," US EPA/ODW, December 1, 1987.

**Raw Data on Costs and Benefits:**

A. Costs (1986$)

Source A reports costs for disinfection only. The source reports total capital costs of $133M and annualized costs (at 3% over 20 yrs.) of $41M. We used this data to back out the annual O&M costs (capital recovery factor associated with r=3%, n=20 = 0.067216 x $133M = $9M Annualized cost of $41M less $9M = $32M annual O&M cost).

Capital cost -- $133M
Annual O&M cost -- $32M

Annualized capital costs were then calculated at capital recovery rates of 4 percent ( $133M x .073582 = $9.7M/yr.) and 10 percent ($133M x .117460 = $15.5M/yr.), respectively, and added to annual O&M costs to calculate total annualized costs:

Annualized costs (r=4%;n=20): $32M + $9.7M = $41.7M/yr.
Annualized costs (r=10%;n=20): $32M + $15.5M = $47.5M/yr.

B. Benefits

No benefit data were reported in Source A.

## 64. Public Notification Rule: Data Summary

**Type of Action --** Final rule (52 FR 41534; October 28, 1987) revises the public notification requirements.

**Regulatory Option Considered --** The regulation includes changes to the general notification regulations, notification when a system violates the secondary standards for flouride, notification of lead contamination, and changes in the State implementation regulations for the minimum public notification requirements a state must adopt to gain primacy over the drinking water program.

**Data Sources Used:**

A. "Information Collection Request for the Public Notification Requirements," US EPA/ODW, August 1987, Sector study profile, prepared by Carl Kessler.

**Raw Data on Costs and Benefits:**

A. Costs (1986$)

Source A reports the first year cost of the regulations is estimated at $.9M. All costs are for mailing, newspaper advertising, etc., and there are no capital costs associated with this regulation.

B. Benefits

No data on benefits were available.

## 66. Class I Underground Injection Wells: Data Summary

**Type of Action --** Proposed regulation (52 FR 32446; August 27, 1987) to amend the technical requirements for Class I hazardous waste underground injection wells (UIW) as well as regulations for underground disposal injection for solvents and dioxins.

**Regulatory Option Considered --** In addition to amending the technical requirements for Class I UIW and establishing regulations for solvents and dioxins, Part 148 of the regulation proposes standards and procedures for evaluating petitions by injectors to determine if they meet migration standards. Part 146 proposes more stringent requirements to insure additional protection of groundwater supplies.

**Data Sources Used:**

A. "Regulatory Impact Analysis of the Underground injection Control Program: Proposed Hazardous Waste Disposal Injection Restrictions," US EPA, ODW, July 24, 1987.

**Raw Data on Costs and Benefits**

A. Costs (1986$)

Source A (p. IV-28) reports costs for the Part 146 amendments baseline scenario as:

Capital cost = $8.562M - $15.607M
O&M costs = $3.473M - $4.969M

Using the midpoint of the cost range:
Capital cost = $12.08M
Annual O&M costs = $4.22M

Part 148 petition costs are reported as $2.4M one-time costs (p. IV-32).

Total Capital costs = $12.08M + $2.4M = $14.48M
Annual O&M costs = $42.22M

We calculated annualized capital costs, over 20 year reported average life of a well, with interest rates of 4 percent ($14.48M x .073582 = $1.06M) and 10 percent ($14.48M x .117460 = $1.70M), respectively. Adding the annualized capital costs to the annual O&M costs we calculated total annualized costs:

Annualized cost (4%;n=20) = $1.06M + $4.22M = $5.28M/yr.
Annualized cost (10%;n=20) = $1.70M + $4.22M = $5.92M/yr.

B. Benefits

Source A (p. VI-1 to VI-19) reports benefits as reduced human health risk resulting from fewer instances of contaminated groundwater. Benefits were not quantitatively assessed.

## 70. Construction Grants Program: Data Summary

**Type of Action --** Construction Grants Program (Regulations in 40 CFR Part 35) provides grant assistance to municipalities for construction of wastewater treatment facilities.

**Regulatory Option Considered --** Municipalities are required to achieve and maintain compliance with their National Pollutant Discharge Elimination System (NPDES) permits in accordance with the requirements of the Clean Water Act (CWA). Permits require municipalities to meet effluent limitations including secondary treatment or more stringent treatment. In order to comply with permits many municipalities require construction of secondary or advanced treatment processes, sewer construction, correction of excessive infiltration/inflow, or correction of combined sewer overflows. The cost data described below is for the 20 year period 1986-2005 (current needs scenario).

**Data Sources Used:**

A. Data Profile, "Municipal Waste Water Treatment", Brian Thompson primary preparer, US EPA, which includes costs data derived from: " Needs Survey Report to Congress", US EPA, 430/9-87-001, February 1987.

B. Information from Brett Snyder, EPA/OPPE, concerning rules-of-thumb for deriving O&M and administrative costs from the capital costs data. These are based on data from the sewage sludge rule supplied by Debra Nicoll, Office of Water Regulations and Standards.

**Raw Data on Costs and Benefits**

A. Costs (1986$)

Source A (p.4) reports:

Capital cost (Current needs scenario- 20 yr. period): $60.3B

In order to calculate annual O&M costs we utilized Brett Snyder's rules-of-thumb for costs breakouts. Capital costs are divided by 4 ($60.3/4 = $15.08B) and annualized over 20 years at 10% ($15.08B x .117460 = $1.77B). This number is multiplied by 1.25 to obtain a rough estimate of annual O&M costs ($1.77B x 1.25 = $2.21B).

Annual O&M costs -- $2.21B

We also calculated annual administrative costs using Brett Snyder's information that these costs are generally 10 percent of O&M costs ($2.21B x .1 = $221M).

Annual administrative costs -- $221M
Total Annual costs -- $2.21B + $0.221B = $2.431B

We calculated annualized capital costs over 20 years at 4 percent ($60.3B x .073582 = $4.436B) and 10 percent ($60.3B x 0.117460 = $7.082B), respectively, and added total annual costs to calculate total annualized costs:

Annualized costs (r=4%;n=20) = $4.436B + $2.431B = $6.867B
Annualized costs (r=10%;n=20) = $7.082B + $2.431B = $9.513B

B. Benefits

Benefits are reported in Source A (pp. 7-8) as an unquantified reduction of risk of disease and infections due to elimination of bacteria and viruses in wastewater. Ecological benefits include decreases in biological oxygen demand, turbidity, nutrient content (nitrogen and phosphorous) and other pollutants, and increases in dissolved oxygen content of receiving waters. These water quality improvements resulting from completed municipal treatment projects will provide public health benefits and reduce costs for water treatment at drinking water facilities. Additional benefits include improved water-related recreational opportunities, commercial fishing and shellfishing, and enhanced aesthetic enjoyment of water resources.

## 71. Secondary Treatment Waivers: Data Summary

**Type of Action --** Final rule (44 FR 34784 and 47 FR 53667) implementing Section 301 (h) of the Clean Water Act for water quality-based variances from the Act's technology-based secondary treatment requirements.

**Regulatory Option Considered --** The rules sets out various criteria under which regulated entities may obtain a waiver from secondary treatment requirements. These criteria are primarily based on protecting receiving waters and marine environments, and include, among other things, compliance with state water quality standards and protection of a balanced indigenous population of fish, shellfish, and wildlife.

**Data Sources Used:**

A. "Sector Study Profile: Secondary Treatment Waiver Regulations", Prepared by John Lishman (OWRS/EPA).

**Raw Data on Costs and Benefits**

A. Costs

Source A reports that "the opportunity to discharge at less than secondary treatment levels affords applicants potential cost savings both in terms of capital costs and operating and maintenance costs".

B. Benefits

Source A reports no quantified data for benefits.

## 72. Municipal Sewage Sludge: Data Summary

**Type of Action --** Final regulation (49 FR 19005; May 4, 1984) designating the 106-Mile Sewage Sludge site as an ocean dumping site.

**Regulatory Option Considered --** Existing sewage sludge dumpers are to transfer dumping from the 12-Mile Site to the 106-Mile Site by the end of December 1987.

**Data Sources Used:**

A. Sector Study Data Profile, "106-Mile Site Municipal Sewage Sludge Site", John Lishman primary preparer, US EPA.

B. "Economic Analysis of Shifting Disposal of Sewage Sludge from the 12-Mile Site to the 106-Mile Site", Development Planning and Research Associates, May 1984.

**Raw Data on Costs and Benefits**

A. Costs (compliance costs in 1982$)

Source B (p. I-5) estimates increased transportation costs to the new site as $24.4M/yr. Additionally, the regulation entails storage costs which were not estimated.

Costs to EPA for monitoring are estimated in the FY 87 budget as $1.1M/yr. Total costs are:

Annual Compliance costs -- $24.4M
Annual Monitoring costs -- $1.1M
Total annual costs -- $25.5M/yr.

We translated 1982$ to 1986$ to calculate:

Total annual costs (1986$) -- $29.1M This is the annualized cost reported in Table I.

B. Benefits

Health, welfare, and ecological benefits are expected but not quantified. Benefits include reduced potential impacts of sewage sludge dumping on shellfisheries and beaches, and reduced degradation of the New York Bight.

## 73. Pretreatment Program: Data Summary

**Type of Action --** Final Rule (40 CFR 403) setting requirements for the establishment and administration of the pretreatment program.

**Regulatory Option Considered --** The regulation implements the National Pretreatment Standards for controlling pollutants which interfere with a Publicly Owned Treatment Work's (POTW) treatment processes or pollutants that pass through a treatment plant untreated. Administrative and reporting responsibilities are established for federal, state, and local governments as well as private industry.

**Data Sources Used:**

A. Cost worksheets for administrative requirements of municipalities, supplied by Brett Snyder (Economic Analysis Branch, OPPE, US EPA.) This data derived from the Pretreatment Audit Summary System which contains audit data from local pretreatment programs nationwide and from discussions with Tom Laverty and Denise Scott of the Office of Water Enforcement and Permits.

B. Sector Study Profile Data, "Pretreatment Program Profile", Denise Scott and Tom Laverty preparers.

**Raw Data on Costs and Benefits**

A. Costs (1986$)

Source A reports the average administrative costs to municipalities of different size categories (by population) and the number of POTW systems affected within each category. All costs are administrative costs:

| Municipality Size (population) | Costs (1986$) | # of affected systems | Total cost |
|---|---|---|---|
| 0-500 | 0 | 0 | |
| 500-2,500 | 0 | 0 | |
| 2,500-10,00 | 11,250 | 8 | 90,000 |
| 10,00-50,000 | 14,167 | 8 = | 113,336 |
| 50,000-100,000 | 47,699 | 8 = | 381,592 |
| 100,000-250,000 | 110,149 | 8 = | 881,192 |
| 250,000-500,000 | 380,533 | 8 = | 24,354,100 |
| over 500,000 | 380,533 | 8 = | 24,354,100 |

Total Administrative Costs -- $50.174M/yr.

This is the annualized cost estimate reported in Table 1.

**73. Pretreatment Program -- continued**

B. Benefits

These regulations relate to the establishment and administration of the pretreatment program rather than to the control of discharges and associated risks. Thus there are no direct benefits associated with the rule.

## 74. Stormwater Regulation: Data Summary

**Type of Action --** Regulation, under development, governing storm water permit application requirements.

**Regulatory Option Considered --** The Water Quality Act requires EPA to promulgate regulations governing storm water permit applications requirements for storm water discharges from large municipal systems and medium municipal storm water systems.

**Data Sources Used:**

A. Profile Data, "National Pollutant Discharge Elimination System Permit Regulations: Application Requirements for Municipal Storm Water Point Sources", David Lee primary preparer, US EPA.

B. Data from Brett Snyder (OPPE) derived from discussions with Jim Gallup (TSB/OWEP).

**Raw Data on Costs and Benefits**

A. Costs (1986$)

Source B reports:

Total capital costs -- $143M.
Annual O&M costs -- $72M/yr.
(Annual O&M for enforcement of permit requirements based on cost per person and the population estimates.)

We used this data to calculate annualized capital costs over 20 years at 4 percent interest ($143M x .073582 = $10.ESM/yr.) and 10 percent interest ($143M x 117460 = $16.79M/yr.) respectively, and added annual O&M costs to calculate total annualized costs:

Annualized cost (r=4%;n=20): $10.5M + $72M = $82.5M/yr.
Annualized cost (r=10%;n=20): $16.7M + $72M = $88.7M/yr.

B. Benefits

Benefits were not reported.

## 75. Sewage Sludge Management: Data Summary

**Type of Action --** Two regulations are under development: one setting technical standards to establish allowable concentrations of pollutants in sewage sludge for each sludge use and disposal option, and the other setting requirements for approval of state sludge management programs and sludge permitting.

**Regulatory Option Considered --** Option 3 for technical standards which would regulate critical sites based on MEI.

**Data Sources Used:**

A. Cost worksheets for the technical standards Option 3, supplied by Debra Nicoll, Office of Water Regulations and Standards, US EPA, January 13, 1988.

B. Sector Study Profile Data on management/reporting requirements, primary preparers of Profile Data - Martha Kirkpatrick and Alan Rubin, costs data derived from "Information Collection Request for Sewage Sludge Management Program," Draft September 1987.

**Raw Data on Costs and Benefits**

A. Costs (1986$)

1. Technical Standards :Source A reports compliance costs associated with publicly owned treatment works using five disposal options -- land application, ocean disposal, monofills, distribution and marketing, and incineration. Total costs for the disposal options are:

Capital costs -- $148.88M
Annual O&M costs -- $35.9M

2. Management/reporting requirements: Source B reports that total annual reporting costs are:

Annual Reporting costs -- $6.549M

We calculated annualized capital costs over 20 years using interest rates of 4 percent ($148.88 x .073582 = $10.95M/yr.) and 10 percent ($148.88 x .117460 = $17.5M/yr.), respectively, and added the annual O&M ands reporting costs to calculate total annualized costs:

Annualized cost (r=4%;n=20)= $35.9 + $6.5 +$10.95 =$53.3M/yr.
Annualized cost (r=10%;n=20) = $35.9 + $6.5 + $17.5 = $59.8M/yr.

B. Benefits

Source A reports that Option 3 will reduce annual cancers by .57 cases and will reduce non-cancer health effects by 130-524 cases per year.

## 76. ELG for Foundries: Data Summary

**Type of Action --** Final regulation (50 FR 45212; October 30, 1985) establishing effluent limitations guidelines and standards for the metal molding and casting (foundry) industry.

**Regulatory Option Considered --** The regulation establishes different types of effluent limitations guidelines and standards including Best Practicable Control Technology Currently Available (BPT), Best Available Technology Economically Achievable (BAT), New Source Performance Standards (NSPS), Pretreatment Standards for Existing Sources (PSES), and Pretreatment Standards for New Sources (PSNS). (Magnesium industries were excluded from PSES and PSNS based on economic impacts)

**Data Sources Used:**

A. "Economic Impact Analysis (EIA) of Effluent Limitation Guidelines and Standards for the Metal Molding and Casting Industry," Office of Water Regulations and Standards, US EPA, September 1985.

B. Profile Data, " Effluent Limitations Guidelines for the Metal Molding and Casting Industry", Mark Luttner primary preparer, US EPA.

**Raw Data on Costs and Benefits**

A. Costs (1985$)

Source A (p. 15) reports costs as follows:

| Limitations | Capital Cost (M) | Annualized Costs (M) |
|---|---|---|
| BPT | $39.7 | $17.4 |
| BAT | 3.9 | 2.3 |
| PSES | 46.7 | 21.5 |
| Total | $90.4 | $41.2 |

The annualized costs represent amortized capital and O&M costs. The annualized costs were calculated at variable capital recovery factors, according to firm size, over a ten year period. For firms with more than 700 employees a 13.89 percent interest rate was used for amortization. (P.III-7) Since most of the regulated firms fall into this size category we used this rate to back out annual O&M costs from the annualized costs: (.190891 x $90.4M = $17.2M/yr. annualized capital cost. Annualized total cost of $41.2M less $17.2M = $24.0 annual O&M costs.)
Total costs translated into 1986$ are:

Capital costs -- $92.34M
Annual O&M costs -- $24.51M

## 76. ELG for Foundries -- continued

We then calculated annualized capital costs over 10 years at interest rates of 4 percent ($92.34M x .123291 = $11.38M/yr.) and 10 percent ($92.34M x .162745 = $15.02M/yr.) respectively, and added the annual O&M costs to calculate total annual cost:

Annualized costs (r=4%;n=10): $11.38M + $24.51M = $35.8M/yr.
Annualized costs (r=10%;n=10):$15.02M + $24.51M= $39.5M/yr.

B. Benefits

Source B reports that EPA did not conduct a risk assessment for this regulation. Water quality analyses estimate that exceedances of water quality criteria in surface streams caused by discharges of metals and/or organic chemicals from direct and indirect plants would mostly be eliminated by this regulation.

## 77. ELG Placer Gold Mining: Data Summary

**Type of Action --** Proposed regulation to establish effluent limitations guidelines and standards for the placer gold mining industry.

**Regulatory Option Considered --** The regulation establishes effluent limitations guidelines and standards including Best Practicable Control Technology Currently Available (BPT), Best Available Technology Economically Achievable (BAT), and New Source Performance Standards (NSPS).

**Data Sources Used:**

A. Profile Data, "ELG for the Placer Gold Mining Industry", Mitchell Dubensky primary preparer, US EPA.

B. Information relayed by Mitchell Dubensky from "Draft Economic Impact Analysis of ELG and Standards for the Placer Gold Mining Industry", Office of Water Regulations and Standards, US EPA, November 1987.

**Raw Data on Costs and Benefits**

A. Costs (1986$)

Source A reports costs as follows:

| Guideline | Capital Cost (M) | Annualized Cost(M) |
|---|---|---|
| BPT | --- | $2.4 |
| BAT | $3.9 | 2.9 |
| Total | $3.9M | $5.3M |

Source B reports that a 14 percent interest rate, over 10 years, was used to annualize capital costs associated with BAT requirements. We used this information to back out the annual O&M costs ($3.9M X .1917135 = $.8M. Annualized cost of $2.9M less .8M = $2.1M annual O&M cost for BAT):

| Guideline | Capital Cost(M) | O&M Cost (M) |
|---|---|---|
| BPT | --- | $2.4 |
| BAT | $3.9 | $2.1 |
| Total | $3.9 | $4.5 |

We then calculated annualized capital costs, assuming a 10 year life, at interest rates of 4 percent ($3.9M x .123291 = $.48M/yr.) and 10 percent ($3.9M x .162745 = $.63 M/yr.), respectively, and added the annual O&M costs to calculate total annualized costs:

Annualized cost (r=4%;n=10): $.48M + $4.5M = $4.98M/yr.
Annualized cost (r=10%;n=10): $.63M + $4.5M = $5.13M/yr.

B. Benefits

Source A reports that EPA did not conduct a risk assessment for this regulation. A cost-effectiveness analysis, however, shows that BAT technology will remove approximately 400,000 pound-equivalents (of arsenic, cadmium, lead, zinc, and copper) at a cost of $3 per pound equivalent.

## 78. ELG for the Organic Chemicals Plastics & Synthetics Fibers Industry: Data Summary

**Type of Action --** Final regulation (52 FR 42522; November 5, 1987) establishing effluent limitations guidelines and standards for existing and new organic chemicals, plastics, and synthetic fibers manufacturing industries.

**Regulatory Option Considered --** The regulations set guidelines and standards including Best Practicable Control Technology Currently Available (BPT), Best Available Technology Economically Achievable (BAT - Option IIB), New Source Performance Standards, Pretreatment Standards for Existing Sources (PSES - Option IV-B) and Pretreatment Standards for New Sources (PSNS).

**Data Sources Used:**

A. "Economic Impact Analysis of Effluent Limitations and Standards for the Organic Chemicals, Plastics & Synthetic Fibers Industry," Abt Assoc., Inc., September 1987.

B. "RIA of the Effluent Guideline Regulations for the Organic Chemicals, Plastics & Synthetic Fibers Industry," Office of Water Regulations and Standards, US EPA, September 18, 1987.

**Raw Data on Costs and Benefits**

A. Costs (1982$)

According to Source A (p.1-3) costs of emission control equipment are as follows (assuming 10 year capital life):

| | Capital Costs(M) | Operating Costs |
|---|---|---|
| BPT | 193.04 | 39.38 |
| BAT* | 322.73 | 152.39 |
| PSES* | 260.71 | 142.75 |
| Total (1982$) | $776.48 | $339.52 |
| Total (1986$) | $885.96 | $387.39 |

*These selected options are determined from the RIA (p.21-22)

We used this information to calculate annualized capital costs over 10 years at 4 percent ($885.96 x .123291 = $109.2M/yr.) and 10 percent ($885.96 x .162745 = $144.2M/yr.), respectively, and added annual O&M costs to calculate total annualized costs:

Annualized costs (r=4%;n=10):$109.2M + $387.39 =$496.5M/yr.
Annualized costs (r=4%;n=10):$144,2M + $387.39 =$531.5M/yr.

**78. ELG Organic Chemicals -- continued**

B. Benefits

Source B (p. 32) reports the following benefits:

1. Non-Quantified Benefits:

a. Integrity of aquatic ecosystems
b. Dermal exposure to contaminated surface waters
c. Ingestion of contaminated fish by those eating more than average amounts
d. Contamination of groundwater sources of drinking water

2. Quantified but Non-monetized Annual Benefits:

a. Non-cancer health risks due to direct discharge releases - 43,000 people exposed to air priority pollutant levels exceeding chronic Rfd levels.

3. Monetized Annual Benefits (1982$)

a. National aggregate water quality benefits (from direct dischargers) - $178 -$330.2M

b. Incremental cancers avoided for priority pollutants from direct dischargers - $.8- $5.9M (.8 cancers reduced annually)

c. Ozone (smog) reduction of priority pollutants from direct dischargers only - $6.3 - $18.5M (valued at $1,250 ton removed)

d. Ozone smog reduction of non-priority pollutants from direct dischargers only - $9.5 - $38.5M (valued at $1,250 ton removed)

Total monetized water quality and smog reduction benefits are $193-$387M/yr. in 1982$ or $220-$441M/yr. in 1986$.

## 79. ELG Pesticides: Data Summary

**Type of Action --** Regulation under development to establish effluent limitations guidelines and standards for the pesticide chemicals industry.

**Regulatory Option Considered --** Previous regulation established Best Practicable Control Technology Currently Available (BPT). The new regulation will establish several kinds of effluent limitations including Best Available Technology Economically Achievable (BAT), New Source Performance Standards (NSPS), Pretreatment Standards for Existing Sources (PSES), Pretreatment Standards for New Sources (PSNS), and Best Conventional Pollution Control Technology (BCT).

**Data Sources Used:**

A. "Economic Impact Analysis of Effluent Limitations Guidelines and Standards for the Pesticide Chemicals Industry," Office of Water Regulations and Standards, US EPA, September 1985.

**Raw Data on Costs and Benefits**

A. Costs ( first quarter 1985$)

Source A reports costs as follows:

| | Capital Costs(M) | Annualized Costs (M) |
|---|---|---|
| Manufacturers | 107,705 | 53,795 |
| Metallo-Organics | 47 | 129.8 |
| Formulator/ Packager | 22,559 | 16,963 |
| Total | $130.311M | $70.887M |

Annualized costs were calculated using a capital recovery factor of .218. (EIA Ch.5) We used this data to back out the annual O&M costs: $130.311 x .218 = $28.4M annualized capital costs. Annualized costs of $70.88 less $28.4 annual capital costs = $42.48M annual O&M costs). Total costs translated into 1986$ are:

Total Capital costs = $137.543M
Annual O&M costs = $44.832M

We used this information to calculate annualized capital costs, over 10 years, at interest rates of 4 percent ($137.543 x .123291 = $16.95M/yr.) and 10 percent ($137.543 x .162745 = $22.38M/yr.), respectively, and added annual O&M costs to calculate total annualized costs:

Annualized costs (r=4%;n=10): $16.95M + $44.83M = $61.7M/yr.
Annualized costs (r=10%;n=10): $22.38M +$44.83M = $67.2M/yr.

B. Benefits

No benefits data were reported.